The Dissertation Committee for Jin Seok Kim certifies that this is the approved version of the following dissertation:

NEIGHBORHOOD EFFECTS ON THE ETIOLOGY OF CHILD MALTREATMENT: A MULTILEVEL STUDY

Committee:

A. James Schwab, Supervisor

Noël Bridget Busch

Jon M. Hussey

Ruth G. McRoy

Daniel A. Powers

Allen Rubin

Neighborhood Effects on the Etiology of Child Maltreatment: A Multilevel Study

by

Jin Seok Kim, B.S.; M.S.; M.S.S.W.

Dissertation

Presented to the Faculty of the Graduate School of

the University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas at Austin

August, 2004

Acknowledgement

I know I cannot do this very well. But, I think I have to do this because there are many people who I owe so much that I just cannot forget about. It may be easy to guess who comes first in the list. Well, don't ask me to be different because I don't want to at this time. Yes, I would like to reserve my first thank you note for my supervisor, Jim Schwab. Most of all, whenever I need him, he was always there for me from the beginning. I feel like he was living with me during the long process. He was persistent and maintained a high standard, which brought me a lot of motivation. Thank you Dr. Schwab.

I also want to recognize Welfare Innovation Project family: Heather, Dina, Carla, and Kelly. They were my coworkers and, more importantly, friends. How can I forget my boss, Miguel Ferguson, and his family at this moment? They have genuinely warm hearts to me and other people. Miguel and Ceci, you should know I just cannot find the right words to express my appreciation for everything, I mean everything, you have done for my family and me. Thank you Miguel, my buddy, and Ceci.

I would also like to appreciate the excellent education I have got here in the University of Texas at Austin. I was very fortunate to have Allen Rubin as my research methodology mentor. I dare to feel confident about my dissertation because he was in my dissertation committee and I passed it. Thank you Dr. Rubin for your great instructions and jokes. (Believe me, sometimes those were very funny!). I have learned a lot also from Diana DiNitto. Diana was a great educator, coworker, and mentor. Most of all, she is an

extremely nice person. Thank you Diana for your supports, nice words, thoughts, and especially big smiles you showed to me. Daniel Powers always welcomed and overwhelmed me at the same time with his incredibly extensive knowledge and talents. Once I took his class, I did not hesitate at all to invite him to my committee and he helped me a lot. Thank you Dan for your time, supports, and cheers.

Noël Busch helped me tremendously with her critical insights about the issue of child maltreatment. Ruth McRoy raised a lot of crucial points that I have not thought about, which expands and enriches my study. It was Jon Hussey of the University of North Carolina who introduced the Add Health study to me. He was nice enough to help me a lot even before we met each other. Jon was always supportive and helpful. Noël, Jon, and Dr. McRoy, thank you all.

Kathleen Casey, my office mate, helped me a lot with her great editing skills. She proofread every single word and sentence and got back to me with enormously helpful feedbacks. My dissertation would have been much harder to read without her help. Thanks Kathleen for your caring, warm hearts, inspirations, and chitchats we shared.

Hey, take it easy, folks. It's your turn now. I am heavily indebted to my "Korean Mafia" in the School of Social Work in various ways. They are a gang of people who consistently cared my family, hanged out with my family, invited and fed my family at their places, shared their good and bad times with my family, prayed for my family, and most of all believed in me whatever I do. They were just like my brothers and sisters. I especially appreciate that they all were caring for my family as well. They should know Suh-Youn feels them all like her aunts and uncles. I am obliged to mention at least their

names here: SeoKoo, HyunSun, EunJung, YoungMi, YeRang, YeoJin, EunJu, SokHo, JongSerl, JooHee, Soyon, WonJu, Boram, Aeri, KiHyang, GaWon, EunSong, YouJung, Anna, Sok, SungIe, SunJu, JiYoung, KyungHee, JiYeon, HongMin, and NamKee Choi, if she doesn't mind putting her name in the list of "Mafia". Thank you all.

This time would not have come to me without my parents-in-law's and parents' emotional and financial supports. For their sleepless nights, concerns, prayers, and tears, I deeply appreciate them. Well, it's almost done but I don't know yet how to thank my love, JungEun. She has been my best friend, soul mate, comrade, role model, mentor, guidance, and company and I thank her for remaining the same throughout and even after this long journey. Thank you very much and I love you, JungEun. Lastly but obviously not the least, I would like to thank Suh-Youn, my precious and definitely adorable daughter. She is such a joy, doubles up the meaning of my life, and makes me smile even in the hardest times of the last five years. Thanks my girl.

Who else I have to remember at this moment? There should be a lot of them. But I guess I have to stop here because, if not, the volume of this dissertation will be proliferated enormously. Thanks a lot all of you.

NEIGHBORHOOD EFFECTS ON THE ETIOLOGY OF CHILD MALTREATMENT: A MULTILEVEL STUDY

Publication No. _____

Jin Seok Kim, Ph.D.

The University of Texas at Austin, 2004

Supervisor: A. James Schwab

The purpose of this study is to examine the neighborhood effects on the etiology of child maltreatment in light of ecological theory. This study focuses on the neighborhood effects on child maltreatment after controlling for individual and family level factors. Furthermore, it is one of this study's main goals to highlight the differences between the etiological model for physical child abuse and that of child neglect. This study utilizes data from the National Longitudinal Study of Adolescent Health, which has been designed to examine the causes of health-related

behaviors of nationally representative sample of early adults in the U.S. between 2001 and 2002. A series of multilevel logistic regression analyses is employed to address the effects of individual, family, and neighborhood level factors on the risk of child maltreatment.

Results indicate that the prevalence rates of child neglect and physical child abuse vary significantly across neighborhood units after controlling for individual and family level factors. This study found that average neighborhood socioeconomic status, violent crime rate, and regional location are significantly associated with the neighborhood level prevalence rate of each type of maltreatment. Furthermore, this study shows that neighborhood effects moderate the impacts of individual and family level factors on the risk of child maltreatment. Various child characteristics are associated in the multilevel model of child maltreatment and found to significantly contribute to parents' overall risk of physically abusing or neglecting their children, over and above the risk associated with parent and family level factors. Separate models for physical child abuse and child neglect are tested and compared, indicating that there are distinctive etiological models for different types of maltreatment.

Lastly, methodological limitations of this study, implications for social work practice, and recommendations for further research are presented.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER I

INTRODUCTION

Kempe and colleagues (1962) published the seminal study on the child maltreatment. The article titled "The battered child syndrome" was instrumental in promoting public attention to this problem. There have been ongoing efforts to explain and prevent the problem in social service area ever since. Despite a growing number of state and federal funded research programs, specialized academic journals, research centers, and government reports, which shed light on the issue of child maltreatment, the results of these efforts have been inconsistent and limited in scope (National Research Council, 1993).

Despite these efforts, the prevalence of child maltreatment in the U.S. is staggering. According to the latest statistics describing the prevalence of child maltreatment in the U.S., child protective service agencies receive more than 50,000 reports a week alleging that children have been maltreated (U.S. Department of Health & Human Services, 2001). This number translates to 3 million referrals a year for 5 million children who are involved (U.S. Department of Health & Human Services, 2001). In 2001, there were an estimated 903,000 children who were victims of child abuse and neglect (U.S. Department of Health & Human Services, 2001). Over twelve out of a thousand children in the whole population were victimized by various types of child maltreatment and over eighteen out of every million children in the population died of abuse and neglect (U.S. Department of Health & Human Services, 2001).

Among the various types of child maltreatment, child neglect is the most frequently reported and substantiated type of maltreatment in the US. In 2001, 59.2% of child maltreatment victims were neglected (including medical neglect) while 18.6% were physically abused, 9.6% were sexually abused, and 6.8% were emotionally or psychologically abused (U.S. Department of Health & Human Services, 2001). However, many argue that, among the various types of maltreatment, the least attention has been given to the child neglect (Zuravin, 1999). This is surprising, not only because neglect is the most prevalent form of maltreatment but its consequences are not less significant than those of other types of child maltreatment (Schumacher, Slep, & Heyman, 2001). Therefore, more research is necessary to examine the etiology and developmental outcomes of child neglect.

Starting from attempts to look at isolated cause-and-effect models explaining child maltreatment, the study on the etiological models of child maltreatment has moved toward approaches that can take the multi-level structure of risk factors into account. Since no single risk factor provides a necessary and sufficient cause of child maltreatment, the ecological framework emerged to build the etiological model of child maltreatment. The ecological approach provides a way to consider the combination of individual, familial, environmental, and social or cultural risk factors all in one framework (National Research Council, 1993).

After Bronfenbrenner (1979) introduced a human ecological perspective into research on child development, many child maltreatment prevention researchers, as well as practitioners, adopted this theoretical framework to understand and assess the risk

factors associated with child maltreatment (Belsky, 1993a; Drake & Pandey, 1996; Garbarino & Sherman, 1980; Jack, 2000; Korbin & Coulton, 1997; Polansky, Gaudin, Ammons, & Davis, 1985; U.S. Advisory Board on Child Abuse and Neglect, 1993; Vinson, Baldry, & Hargreaves, 1996; Zuravin, 1989). One of ecological theory's unique contributions to child maltreatment research is to highlight the importance of understanding the larger context of human ecology, which includes family, neighborhood, and society overall, than parent-child dyadic interaction to explain the problematic behavior. In this light, efforts to build a model of the neighborhood effects on parents and children has been made by researchers and practitioners from various disciplines (e.g.,Coulton, Korbin, & Su, 1996; Janson, 1980; Sampson, Morenoff, & Earls, 1999; Shinn & Toohey, 2003; Turley, 2003; Vela-McConnell, 1999). In response to these efforts, the U.S. Advisory Board on Child Abuse and Neglect (1993) recommend strengthening neighborhoods as a first step to better protection of children.

Neighborhoods are recognized as an important factor in the ecology of child maltreatment (Garbarino & Sherman, 1980; U.S. Advisory Board on Child Abuse and Neglect, 1993; Vinson et al., 1996). The underlying assumption of neighborhood-based initiatives is that people "will be better understood and thus better served if child protection is in closer proximity than has traditionally been the case" (Korbin, Coulton, Lindstrom-Ufuti, & Spilsbury, 2000, p. 1510). However, it is unclear which neighborhood conditions and factors affect child maltreatment (National Research Council, 1993). Even with the identified neighborhood factors considered, how neighborhood factors interact with other individual and/or familial level risk factors to

affect child maltreatment needs more insight.

Research Gap in Previous Studies

Previous research on the etiology of child maltreatment has focused mainly on identifying the individual level risk factors of child maltreatment. Although the early efforts to identify psychopathology of child abusers contributed to a better understanding of individual level key risk factors that affect the occurrence of child maltreatment, the findings from this approach have been criticized as inconsistent (Gelles, 1973).

Since the ecological framework was introduced to the child maltreatment research, investigators have included larger context of human ecology-family, neighborhood, and culture and society-into the etiology of child maltreatment (Belsky, 1993a). However, a large part of the existing research examining the association between neighborhood characteristics and child maltreatment has been done at the aggregate level, with a neighborhood or community as a unit of analysis (Coulton, Korbin, & Su, 1999). With a very few exceptions (e.g., Coulton et al., 1999), previous studies failed to control for individual level risk factors of child maltreatment when they used neighborhood as a unit of analysis (e.g., Coulton, Korbin, Su, & Chow, 1995; Drake & Pandey, 1996).

Moreover, even the exemplary study (Coulton et al., 1999) from the genre that takes both the individual and neighborhood level risk factors into account is not without limitations. First, as with other local based studies, the generalizability of Coulton et al.'s findings is limited to the specific locality of the study or, at most, other areas with similar geographic and societal characteristics. Second and more importantly, the study lacks the

interactive perspective that emphasizes the maltreatment-eliciting role of the child in the incidence of child maltreatment. All the individual level risk factors in this study were parental characteristics. Third, the individual level and family level risk factors included in Coulton's study were limited and, consequently, possessed weak explanatory power as a child maltreatment model.

Another body of child maltreatment research failed to account for the differences between distinct types of child maltreatment. Some focused on a specific type of child maltreatment, such as physical abuse or sexual abuse, while others put different types of maltreatment together to create a single construct of child maltreatment without critical attention to the heterogeneity among the different types of child maltreatment (Heller, Larrieu, D'Imperio, & Boris, 1999).

An extensive literature review by Behl and colleagues (Behl, Conyngham, & May, 2003) revealed that the overall proportion of articles that failed to distinguish between specific types of maltreatment decreased between 1977 and 1998. However, over a half studies examined a single type of child maltreatment, which may reflect the lack of research focus on the comparative perspective between different types of child maltreatment. In this regard, studies focusing on differences as well as similarities in the etiologies of various types of maltreatments are still needed (National Research Council, 1993). Furthermore, a relatively small portion of child maltreatment research efforts have focused on child neglect despite the fact that it is most prevalent among the various types of child maltreatment (Behl et al., 2003; Zuravin, 1999).

Another notable problem in child maltreatment literature is the lack of emphasis

on protective factors of child maltreatment compared to risk factors. While most child maltreatment literature has focused on the risk factors of child maltreatment, few studies have explored the interactive nature between various risk factors and protective factors (Kirby & Fraser, 1997).

Purpose of the Study

This study proposes to address the shortcomings within child maltreatment literature. In this study, various risk factors associated with child maltreatment are addressed. Based on the developmental-ecological framework (Belsky, 1980) and transactional-ecological framework (Cicchetti & Lynch, 1993), risk factors from each level of ontogenic (individual), microsystem (familial), exosystem (neighborhood), and macrosystem (cultural and societal) are identified and tested using appropriate statistical analysis methods. Furthermore, the main focus of this study is the neighborhood level risk factors that are significant predictors of child maltreatment rates over and above the effects of individual level risk factors, and examining its interactions with other factors of different levels.

Limitations of the current understanding regarding neighborhood factors in general, as well as their specific relationship to child maltreatment context are examined. Using the National Longitudinal Study of Adolescent Health (Add Health) data, this secondary data analysis study proposes a new model of measuring neighborhood factors associated with child maltreatment. This model, detailed in the Chapter III, includes three distinct domains of neighborhood factors: geographical, structural, and perceptual

domains as a more comprehensive way to understand the risk factors associated with child maltreatment. While geographical and structural domains of neighborhood factors are widely addressed in the child welfare literature, perceptual domains of neighborhood construct is not widely acknowledged.

Various types of confounding interactions among the alleged risk factors in the proposed model are also examined. Mediation and moderation effects among the risk factors are identified and tested within a broader ecological framework. Various cross-level (e.g., between individual and neighborhood levels) interactions are hypothesized and tested. The examination of these interaction effects contributes to building the knowledge base regarding the role of neighborhood level factors in the various routes leading to child maltreatment.

Protective factors of child maltreatment are identified and investigated. The interplay between risk and protective factors that may result in resilience to the occurrence of child maltreatment are also examined. Rather than exploring the effect of the protective factors in an additive way (i.e., where risk and protective factors are viewed as polar opposites along a continuum), this study inspects whether they have interactive effects as well. In the interactive model, it is assumed that protective factors only have an impact in combination with certain risk factors (Fraser, 1997).

Furthermore, special emphasis is given to developing and testing a risk factor model for child neglect. A risk factor model of child neglect, which is distinct from that of other types of child maltreatment, is developed and tested.

CHAPTER II

LITERATURE REVIEW & CONCEPTUAL FRAMEWORK

This chapter provides a review of relevant literature regarding the issue of child maltreatment and a delineation of the conceptual framework for this study. In the first section of this chapter, a brief overview of the etiological theories of child maltreatment is provided. The theories reviewed in the first section are the psychopathology model and the social-psychological model of child maltreatment. The current status of theory development in etiology of child maltreatment is subsequently reviewed.

Following the discussion of theory development, developmental-ecological theory of Belsky (1980; 1993a) and transactional-ecological model of Cicchetti and colleagues (Cicchetti & Lynch, 1993) are reviewed, as examples of integrative approaches to understanding the problematic behavior in the larger context of human ecology. Based on the integrative theoretical framework just introduced, risk factors associated with child maltreatment are identified at each level of human ecology.

Although the ecological framework of child maltreatment provides a way to associate the various risk factors from different human ecological systems (e.g., individual, family, neighborhoods, and society) into a child maltreatment risk model, how those neighborhood factors affect the occurrence of child maltreatment has not been clearly understood (National Research Council, 1993). In the second section, the neighborhood factors for child maltreatment, which is the main focus of this dissertation, are presented in detail to fill the gaps in current understanding of neighborhood effects on

child maltreatment. After providing a general overview of previous research findings on neighborhood effects on child maltreatment, key process models from the various disciplines are introduced and briefly described in the first part of the second section. These process models both compete and compliment each other and, for the purpose of this study, are used as building blocks for a conceptual framework. Also, three distinct domains of neighborhood factors are constructed for this study as an alternative way of integrating neighborhood effects regarding the issue of child maltreatment.

Finally in the last section of this chapter, the conceptual framework for this study is delineated using a structural model among the constructs. This structural model plays a key role in shaping this investigation.

Etiology of Child Maltreatment

Researchers contend that the etiology of child maltreatment is complicated by certain factors of child maltreatment including:

> (1) the extremely socially deviant nature of the behavior (2) its low prevalence, (3) the presence of multiple factors in the context of child maltreatment, such as poverty and violence, (4) the changing political and historical definitions of the behavior, and (5) the troubling and complex nature of the behavior that requires a rethinking of conventional wisdom about human nature and parenting (National Research Council, 1993, p. 106).

However, the lack of consensus on how to operationally define and theoretically explain child maltreatment stands out among the major problems in determining the etiology of child maltreatment.

While each distinctive type of maltreatment requires a differential definition and unique conceptual and theoretical framework, the empirical data to develop these distinct theories is not generally available (National Research Council, 1993). Although there are a few attempts to develop separate theoretical models by type of maltreatment (e.g., Azar, Povilaitis, Lauretti, & Pouquette, 1998; David A. Wolfe, McMahon, & Peters, 1997), they have been limited by the fact that the range of data available varies across the various kinds of maltreatment. Currently, it appears that enough data have been accumulated to develop more sophisticated models only for physical and sexual abuse (Azar et al., 1998). For this and other reasons, etiologies and outcomes related to multiple forms of child maltreatment have not been well differentiated in child maltreatment research (National Research Council, 1993).

A study of the child maltreatment literature over a 22-year period, from 1977 to 1998, revealed that the articles examining child physical abuse account for 20.2% of overall child maltreatment literature (N=2,090), while articles examining child sexual abuse account for 32.7%, child neglect 9.0%, and child emotional abuse 4.2% of overall child maltreatment literature (Behl et al., 2003). Child maltreatment experts (e.g., Behl et al., 2003; Dubowitz, 1999; Grayson, 2001) have long argued that specific types of child maltreatment other than physical and sexual child abuse, especially child neglect, needs more research attention.

Given these limitations of theory development within child maltreatment, a review of the major theoretical perspectives of child maltreatment is provided. Following the theoretical overview, strengths and weaknesses of the earlier child maltreatment models are addressed.

Review of Child Maltreatment Theory

The etiology of child maltreatment has been examined by researchers from various disciplines such as sociology, psychology, and medical science. All of these efforts have contributed to the current understanding of child maltreatment. Although simple models from different disciplines identified key factors affecting the occurrence of child maltreatment, they fail to build a solid theoretical model describing causal relationship among the identified risk factors (National Research Council, 1993). The complexity of the influential and causal factors of the child maltreatment forced the researchers to work together in combining theories and empirical findings from the various disciplines.

Partly due to the multi-disciplinary nature of child maltreatment research, theories regarding etiology of child maltreatment vary across a number of dimensions. The variation exists within definitions of child maltreatment (e.g., legal or clinical), relationship of perpetrators with victims (e.g., intra-familial or extra-familial), level of complexity (e.g., single factor or multiple factors), and focus of analysis (e.g., biological, personality-emotional, structural-cultural) (Azar, 1991).

In this regard, theories of child maltreatment can be categorized in various ways

(e.g., Barnett, Miller-Perrin, & Perrin, 1997; Tzeng, Jackson, & Karlson, 1991; Wallace, 1999; C. A. Winton, 1995). For example, Azar, Povilaitis, Lauretti, and Pouquette (1998) provided a framework to build models of intra-familial child maltreatment. This framework categorized the existing theories of child maltreatment based on definitions, assumptions, levels of analysis, complexity, and model form (Azar et al., 1998).

Also, Winton and Mara (2001) summarized the previous studies and provided a classification scheme for theories and models of child maltreatment. They included the medical (biological) model, the sociobiological/evolutionary theory, and the psychodynamic/psychoanalytic theory into the psychiatric/medical/psychopathology models category. Social learning theory, intergenerational transmission theory, exchange theory, symbolic interaction theory, and structural family systems theory were incorporated into the social-psychological models category. Finally, the ecological theory, feminist/conflict theory, structural-functional/anomie/strain theory, and cultural spillover theory were combined into sociocultural models category (M. A. Winton & Mara, 2001). As mentioned previously, since these theories and models originate from sociology, medicine, psychology, social work, and criminology, it is not unusual for the study to move across different levels of analysis such as individual, family, group, and society (M. A. Winton & Mara, 2001).

A comprehensive review of each theory is beyond the scope of this dissertation.[1] However, a brief review of major approaches to child maltreatment is provided in the following. Two early models of child maltreatment, the psychopathology model and

[1] Interested readers are advised to read Winton and Mara (2001) which provides an introductory description of each theory.

social-psychological model are briefly described. It is followed by the description of the current status of theories in child maltreatment etiology and an explanation of why an integrative theory, such as ecological theory, is needed to better understand the occurrence of child maltreatment.

Psychopathology Model

Since it was the medical professionals who first brought social attention to the issue of child maltreatment (e.g., Kempe et al., 1962), numerous attempts have been made to understand this issue by examining the perpetrator's psychological and biological characteristics. In the early stage of the medical approach to child maltreatment, perpetrators were considered as criminally inclined or psychiatrically disturbed because child abuse was viewed as a deviant act (Spinetta & Rigler, 1972). As a result, early clinical efforts to understand child maltreatment (e.g., Kempe et al., 1962; M. S. Rosenberg & Reppucci, 1983) focused predominantly on the individual personality dimensions considered responsible for the occurrence of child maltreatment (Gelles, 1973; David A. Wolfe, 1999).

The psychiatric model identifies behavioral, cognitive, and emotional dimensions of individual characteristics which distinguishes abusive and non-abusive parents. For example, social isolation, impulsivity, chronic aggressiveness, rigid and domineering interpersonal style, impulsivity, problems originated from marital conflict, and limited parenting skills are assumed to be the most outstanding behavioral characteristics of child abuse perpetrators (David A. Wolfe, 1999). Other cognitive and emotional traits such as

emotional immaturity, low frustration tolerance, difficulty expressing anger appropriately, high, or unrealistic, expectations to children, and feelings of inadequacy and low self-esteem are described as distinctive characteristics of abusive parents (David A. Wolfe, 1999).

This approach clearly made a major contribution to the development of child maltreatment theory in terms of identifying individual characteristics of abusive parents. However, psychiatric attempts to differentiate abusers from non-abusers based on traditional measures of personality disorders or psychopathology have not been successful (Gelles, 1973; David A. Wolfe, 1985). This failure is partly due to the psychopathology model's lack of emphasis on significant environmental and situational factors such as poverty and stressful life events.

Social-Psychological Model

It was more than three decades ago that researchers in child maltreatment area began to realize that physical abuse and neglect were not necessarily committed by parents with malicious intent, but most likely to emerge among those families lacking resources and skills for parenting their children appropriately (e.g., Belsky, 1980). Unsatisfied by the model that put the majority of emphasis on parental deviance, child maltreatment researchers turned their attention to psychological processes that integrate family and societal factors as well as individual factors to explain the abusive behavior (David A. Wolfe, 1999).

The main focus of the psychological model of child maltreatment is placed on

parent-child interactions. Various types of cognitive and behavioral theories and research findings played important roles in shaping this model of child maltreatment. Social learning theory purported that child abusive behaviors were learned by observing abusive behaviors of others, such as parents or neighbors. Cognitive approaches to child maltreatment contended that such cognitive factors as believing in harsh discipline, having unrealistic expectations to one's children, and perceiving themselves as inadequate parents would affect the parents' abusive behavior.

Several empirical studies using matched control groups and psychometric approaches to assess abusive parents found some overlaps with the psychological characteristics of abusive parents identified by earlier psychiatric approaches (David A. Wolfe, 1999). Empirical studies on the basis of the psychological model of child maltreatment reaffirmed the differences between abusive and non-abusive parents in terms of cognitive and behavioral characteristics, including having unrealistic expectations of their children (Azar, Robinson, Hekimian, & Twentyman, 1984), experiencing high degree of stress as a result of their children's misbehavior (Frodi & Lamb, 1980; Mash, Johnston, & Kovitz, 1983; M. S. Rosenberg & Reppucci, 1983), perceiving themselves as inadequate and incompetent in their parenting role (David A. Wolfe, 1991), possessing poor problem solving skills (Azar et al., 1984), and expressing anger inappropriately (D. A. Wolfe, Fairbank, Kelly, & Bradlyn, 1983).

Although its focus was limited to examining the child-parent dyad relationship, the psychological approach began to study child maltreatment in the broader context than individual psychopathology, such as family, community, and society where the child-

parent interactions took place (David A. Wolfe, 1999). Despite this contribution to the field, the model failed to fully account for the other necessary dimensions of human ecology and the interactions between them (David A. Wolfe, 1999).

Current Status of Child Maltreatment Etiology & Emergence of Integrative Theories

Theories of child maltreatment have evolved from single cause and effect models to multifaceted ones that consider various pathways of occurrences and interactions among the factors of multiple dimensions (National Research Council, 1993; David A. Wolfe, 1999). In child maltreatment research, it is not hard to find inconsistencies in the literature relevant to the same risk factors. Although the theoretical inconsistencies are understandable given vast range of existing framework, the more significant concern is that the empirical findings are inconsistent across the studies (Belsky, 1993a).

For example, although the intergenerational transmission of child abuse is a concept widely accepted by the researchers in this area (Buchanan, 1996; Curtis, 1963; Dubowitz, Hampton, Bithony, & Newberger, 1987; Egeland, Jacobvitz, & Sroufe, 1988), one study reported that the average rate of intergenerational transmission of child maltreatment was 30%, with a range of 70% (Egeland & Jacobvitz, 1984) at the highest and 7% (Gil, 1973) at the lowest rates among the reviewed studies (Kaufman & Zigler, 1987). This example further highlights the importance of considering situational and interactive effects when introducing a risk factor of child maltreatment, because it is reasonable to assume that the wide variation among intergenerational transmission rate is due to other contextual factors for each study that are not taken into consideration.

As briefly reviewed above, earlier models of child maltreatment have identified a sufficient number of causal agents-or "risk factors"-to explain the occurrence of child maltreatment. Child maltreatment experts agree that no single model adequately integrates all the critical risk factors into an effective explanatory model. The problematic behavior must be studied with all the ecological and situational factors taken into account (Belsky, 1980, 1993a; National Research Council, 1993).

In the following sections, the developmental-ecological model (Belsky, 1980, 1993a) and the transactional-ecological model (Cicchetti & Carlson, 1989; Cicchetti & Lynch, 1993; Lynch & Cicchetti, 1998) are presented in detail. These two theoretical models merit special attention because of their emphases on the multi-causal and interactive etiology of child maltreatment (National Research Council, 1993).

Developmental-Ecological Theory of Child Maltreatment

Consensus in the literature (e.g., Azar et al., 1998; Belsky, 1980, 1993a; National Research Council, 1993; David A. Wolfe, 1999) maintains that no single factor fully explains the occurrence of child maltreatment. With the ever-increasing number of theoretical models of child maltreatment and associated risk factors, researchers and practitioners began to recognize the need for an integration of the various models (Belsky, 1980). While earlier models of child maltreatment contributed to the development of theory in terms of identifying risk factors associated with child maltreatment, they failed to provide a solid etiological model which delineates the complex causal and/or

interactive relationships among the factors.

It is now widely agreed that risk factors are either situational or interactive and function in the larger context of human ecology where child-parent interactions take place. Since Gil (1970) first introduced the role of the ecological context, as in the impact of poverty and family disadvantage on the rates of violence against children, many investigators have increasingly recognized the importance of the sociocultural factors on child maltreatment (National Research Council, 1993).

The ecological approach to examining human behavior, including child maltreatment, is multidimensional. As Belsky (1980) mentioned, the ecological model of child maltreatment is:

> a system capable of integrating divergent etiological viewpoints that stress psychological disturbance in parents, abuse-eliciting characteristics of children, dysfunctional patterns of family interaction, stress-inducing social forces, and abuse-promoting cultural values (p. 320).

Drawing heavily from Bronfenbrenner's division of human ecological system into the micro-, exo-, and macrosystems (Bronfenbrenner, 1979), Belsky published a groundbreaking article attempting "an ecological integration" of the etiological theories of child maltreatment (Belsky, 1980). This essay successfully integrated Bronfenbrenner's ecological model of human development (Bronfenbrenner, 1977, 1979) and behavioral development theory (Burgess, 1978). Pointing out the lack of

consideration of individual differences within the general ecological theory of human development, the developmental-ecological approach introduced the analysis of behavioral development (Burgess, 1978; Tinbergen, 1951) to provide an integrative framework for understanding child maltreatment (Belsky, 1980).

The ecological framework includes not only individual level cognitive, behavioral, emotional, and personality factors but also the broader context of family, neighborhood, and societal factors. As detailed later, the developmental-ecological theory identifies the risk and protective factors from each level of human ecology (i.e., ontogenic or individual developmental system, microsystem, exosystem, and macrosystem) and provides a systematic method of integrating all those factors into one model.

The ecological viewpoint expanded the realm of definition and suspected causes of maltreatment. Rather than dichotomizing abusive versus non-abusive parents' characteristics, this theory introduced the effect of contextual factors to the explanation of child maltreatment. Furthermore, it shed more light on the function of situational context as opposed to an individual's personality weaknesses (David A. Wolfe, 1999).

In the following section, each level of the human ecological system (i.e., ontogenic-developmental, micro-system, exo-system, and macro-system) is reviewed in terms of its role in child maltreatment. The general description of each dimension within ecological system and a list of the major risk factors in each level are provided.

Ontogenic developmental system

Ontogenic development refers to the unique characteristics that an individual parent originally have and brings into the family system, parenting role, and larger society. In child maltreatment, individual differences are carefully examined in terms of the parents' childhood history of the abusive parents. In this way, the ecological theory attempts to explain how an individual parent grows up to be an abusive or neglectful (Belsky, 1980).

Since child maltreatment occurs between two or more people (i.e., child and perpetrator or parents), both parent factors and child factors are examined and considered separately. Parental factors include the abusive individual's childhood history of abusive parents, personality factors, and psychological resources (Belsky, 1993a). With the childhood history of abusive parents, the most commonly identified characteristic is a history of being abused in their own childhood (Curtis, 1963; Egeland & Jacobvitz, 1984; Ertem, Leventhal, & Dobbs, 2000; Gil, 1973; Kaufman & Zigler, 1987). The parents' perceived childhood social support is also frequently noted (Black, Heyman, & Slep, 2001). In their bivariate analysis, Whipple and Webster-Stratton (1991) found that abusive mothers were less likely to have supportive mothers than non-abusive mothers were.

Although there is on-going disagreement in the literature, many studies suggest the associations of child maltreatment with various personality factors including low self-esteem (Oates & Forrest, 1985; Pelton, 1994), depression (Chaffin, Kelleher, & Hollenberg, 1996), anxiety (Lahey, Conger, Atkeson, & Treiber, 1984; Pianta, Egeland, &

Erikson, 1989; Whipple & Webster-Stratton, 1991), and antisocial behavior (National Research Council, 1993). These personality factors contribute to child maltreatment by disrupting social relations, limiting the utilization of social supports, and limiting the ability to cope with stress (Crittenden, 1985; David A. Wolfe, 1985).

Growing research attention is paid to the role of psychological resources in the process of personal characteristics turning into actual abusive behavior (Belsky, 1993a). Among the most frequently addressed psychological factors in the literature are negative reactivity (Disbrow, Doerr, & Caulfield, 1977; Frodi & Lamb, 1980; David A. Wolfe, 1985), attributional style (Bugental, Blue, & Lewis, 1990), and distorted cognition about their children.

Although previous studies frequently mention alcohol and other drug (AOD) abuse as potential risk factors for child maltreatment, the association between child maltreatment and AOD abuse is inconsistent across the studies (National Research Council, 1993; Rossow, 2000; Widom, 2001). Recently, some of the methodologically developed studies provide empirical support for the association between AOD abuse and child maltreatment (e.g., Chaffin et al., 1996; Kelleher, Chaffin, Hollenberg, & Fischer, 1994; Miller, Smyth, & Mudar, 1999). However, it is still unclear whether there exists a linear relationship between drinking level and patterns and the risk of child maltreatment (Rossow, 2000).

While studies report inconsistent results, parenting as an adolescent has also been cited as a possible risk factor for child maltreatment (e.g., J. M. Leventhal, 1981; Massat, 1995; Zuravin, 1988). The seemingly contradictory findings regarding the association

between the parents' age and child maltreatment risk might have emerged from differences in the operationalization of age across the studies (National Research Council, 1993). For example, research suggests that mother's younger age at the time of birth of the abused child was associated with higher risk of physical abuse (e.g., Connelley & Straus, 1992)[2] whereas there is no definite relationship between mother's age at the time of abuse (e.g., Massat, 1995).

Another important consideration in the ontogenic development of child maltreatment is child factors. It seems intuitively obvious that parental risk factors of child maltreatment would likely interact with the maltreatment-eliciting role of difficult child behavior (Belsky, 1993a). Indeed, the findings that some abused children were abused again in different settings such as foster homes suggest the influence of child factors (National Research Council, 1993). Among the frequently identified child risk factors related to maltreatment are age, gender, physical health indicators including prematurity and low birthweight, and behavioral factors such as temperament (Belsky, 1993b; National Research Council, 1993). Although controversial (J. M. Leventhal, 1981), research findings suggest that child factors such as prematurity, low birthweight, and illness or disability in the infant interfere with attachment and bonding, which results in the child's increased vulnerability to maltreatment (Lynch & Roberts, 1977).

It is important to note that ontogenic factors of child maltreatment must not be viewed as pre-determining factors of abusive parenting. More specifically, ontogenic factors are either moderated or mediated by other factors and no single ontogenic factor is

[2] However, another study (Zuravin, 1988) provides an inconsistent result.

individually responsible for causing parents to abuse their children.

Microsystem

Microsystem in the ecological perspective refers to the immediate family system where children and parents spend most of their lifetime. Many studies of child maltreatment have focused on the family system because the most abuse takes place in a family setting. In 2000 alone, for example, over 80% of total child maltreatment cases were committed by one or both parents (U.S. Department of Health & Human Services, 2000).

As consistently stressed by child maltreatment researchers, child maltreatment has to be considered an interactive process within the microsystem of family (Belsky, 1980). While ontogenic factors cover the individual-developmental characteristics of children and parents who are two key components of a family system, the microsystem puts more emphasis on the interactive relationship between those key family members and the family structure they reside in. Furthermore, the microsystem in the ecological framework concerns not only child-parent dyadic relationship but also aspects of family relationships such as mother-father relationships and sibling relationships.

The characteristics of the family microsystem that are frequently addressed include: social isolation (Whipple & Webster-Stratton, 1991), family structure and household size (Gillham et al., 1998; National Research Council, 1993; Stiffman, Schnitzer, Adam, Kruse, & Ewigman, 2002; Webster-Stratton, 1989), marital discord (Rosenbaum & O'Leary, 1981; Whipple & Webster-Stratton, 1991), parenting style

(National Research Council, 1993), use of physical discipline (Lorber, Felton, & Reid, 1984; Trickett & Susman, 1988), and stressful life events in the family system (Egeland, Breitenbucher, & Rosenberg, 1980).

When social isolation and marital relationship were examined in light of parental stress, abusive mothers reported higher level of marital dissatisfaction and social isolation than their non-abusive counterparts (Whipple & Webster-Stratton, 1991). Family structure (i.e., single-, both-, or step-parent family) is also frequently investigated as a risk factor (Chaffin et al., 1996; Sedlak, 1997) but often, if not always, inextricably linked to poverty at the same time (Gelles, 1992; Hay & Jones, 1994).

Exosystem

One of the biggest contributions of the ecological perspective is its appreciation of the nestedness of individual and family within larger social system (Belsky, 1980). Again, no single factor regarding child maltreatment is context-free. What this proposition stresses in the ecological framework of child maltreatment is that, neither ontogenic nor microsystem family factors, function independently from the larger community where the individuals and families reside.

The exosystem refers to formal and informal social structures, or institutions, that have an impact on the individual's and family's immediate environment (Belsky, 1980; Cicchetti & Lynch, 1993). At the early stage of the theory development, sociologically-oriented investigations of the exosystem level risk factors of child maltreatment were mainly focused on the world of work and the neighborhood (Belsky, 1980).

Recently, however, researchers have realized that there may be other factors interacting with the individual and the family, including the media, the school settings, religion, and peer groups (National Research Council, 1993). The social structures influencing child maltreatment include: neighborhood, social networks and support groups, social services, availability of employment, and community level socioeconomic status (SES) (Cicchetti & Lynch, 1993).

The most frequently cited exosystem level factors regarding child maltreatment are employment status, poverty, community violence, ethnic concentration, social isolation, and lack of formal and informal social support systems.

Macrosystem

The macrosystem refers to "the larger cultural fabric in which the individual, the family, and the community are inextricably interwoven" (Belsky, 1980, p. 328). The cultural and social values and norms affect the parent's abusive behavior via supporting or discouraging certain individual and family life styles and community services which are embedded in the society. This social and cultural atmosphere exerts itself on individual and family living styles (e.g., parenting style) in both overt (e.g., law) and covert (e.g., mass-media) manners.

The macrosystem factors were often considered an invisible layer in theoretical framework of child maltreatment (National Research Council, 1993) and, consequently, many studies failed to incorporate this dimension into their research design. However, the extent to which the macrosystem affects individual and family life is ever increasing and

its importance is now widely recognized. Especially, as the effect of mass-media via television, for example, pervades deeply into the life of individual and family, the association of media and child abuse has been proposed (Wharton & Mandell, 1985).

The most markedly mentioned macro level factors regarding the etiology of child maltreatment are society's attitude toward violence, physical punishment, and children (Belsky, 1980, 1993a). Furthermore, the history of slavery in the U.S. is also proposed as a contribution to the disproportionate representation of ethnic minorities in reports of abuse (Belsky, 1993a).

In this section, each aspect of human ecology and its major risk factors are reviewed in the developmental-ecological framework of child maltreatment. One of the limitations of the developmental-ecological framework of child maltreatment is that it does not associate resiliency factors into the child maltreatment model. This limitation is addressed in the transactional-ecological model of child maltreatment (Cicchetti & Lynch, 1993; Cicchetti & Rizley, 1981), which is described in the following section. While the transactional-ecological model adopts the same dimensions of human ecology as the developmental-ecological theory (i.e., ontogenic, micro-, exo-, and macro-system), it provides special emphasis on the transactions between the risk potentiating factors and risk compensatory factors in occurrences of child maltreatment (Cicchetti & Rizley, 1981).

Transactional-Ecological Model of Child Maltreatment[3]

Approximately two decades ago, Cicchetti and Rizley (1981) proposed a theoretical model of child maltreatment that tackled the causes and consequences of child maltreatment as well as the process of intergenerational transmission of child maltreatment. Their work provided special insight into the interplay of risk factors and abusive behavior (Cicchetti & Rizley, 1981). In a transactional approach, the environmental forces from every layer of human ecology and the individual level characteristics of caregivers and child are viewed as collectively influencing each other and making reciprocal interactions to the events and outcomes of child development (Sameroff & Chandler, 1975).

Drawing heavily from two theoretical models of child maltreatment, the transactional model of Cicchetti and Rizley (1981) and the ecological model of Belsky (1980), the ecological/transactional model, referred to as the "transactional model" for abbreviation purpose, attempted to provide "a broad and integrative explanatory framework" (Cicchetti & Lynch, 1993, p. 98) to understanding the manifestation of child maltreatment. While the main foci of previous theoretical frameworks were placed on the etiology of child maltreatment, the transactional model attempts to explicate the consequences of child maltreatment on the victim's developmental outcomes (Cicchetti & Lynch, 1993). In this regard, the transactional model of child maltreatment modified its two predecessors, the ecological theory and the transaction model, to explain both process and developmental pathways (Cicchetti & Lynch, 1993).

[3] The contents of this section were heavily drawn from Cicchetti & Lynch (1993) and Cicchetti & Toth (1995).

Cicchetti and Lynch adopted the ecological model, including macro-, exo-, micro-system, and individual-ontogenic development, as a basic framework of examining risk factors for child maltreatment. However, the transactional model divided the risk factors using two categories of *potentiating* factors and *compensatory* factors (Cicchetti & Lynch, 1993). The potentiating factors increase the likelihood of maltreatment, whereas the compensatory factors decrease it. Furthermore, they also made temporal distinctions for both categories of risk factors: *transient* factors and *enduring* factors (Cicchetti & Lynch, 1993).

The structure of the different risk factors in the transactional model can be presented using a quadrant space or two-axis coordinate system. As shown in Figure 1, each axis of the four-quadrant risk factor space represents a distinct dimension of risk factors. Within the structure, the vertical axis is placed along the temporal dimension, from transient to enduring factors, and the horizontal axis is positioned along the potentiating-compensatory dimension.

In Figure 1, the *enduring vulnerability factors* refer to relatively long-lasting risk potentiating factors, conditions, or characteristics of maltreatment. This may be related to the child and parent's individual or environmental factors. These long-lasting risk potentiating factors can be biological, historical, psychological, and sociological. A classic example of a long lasting risk potentiating factor is a parent with a history of being maltreated as a child (Cicchetti & Lynch, 1993).

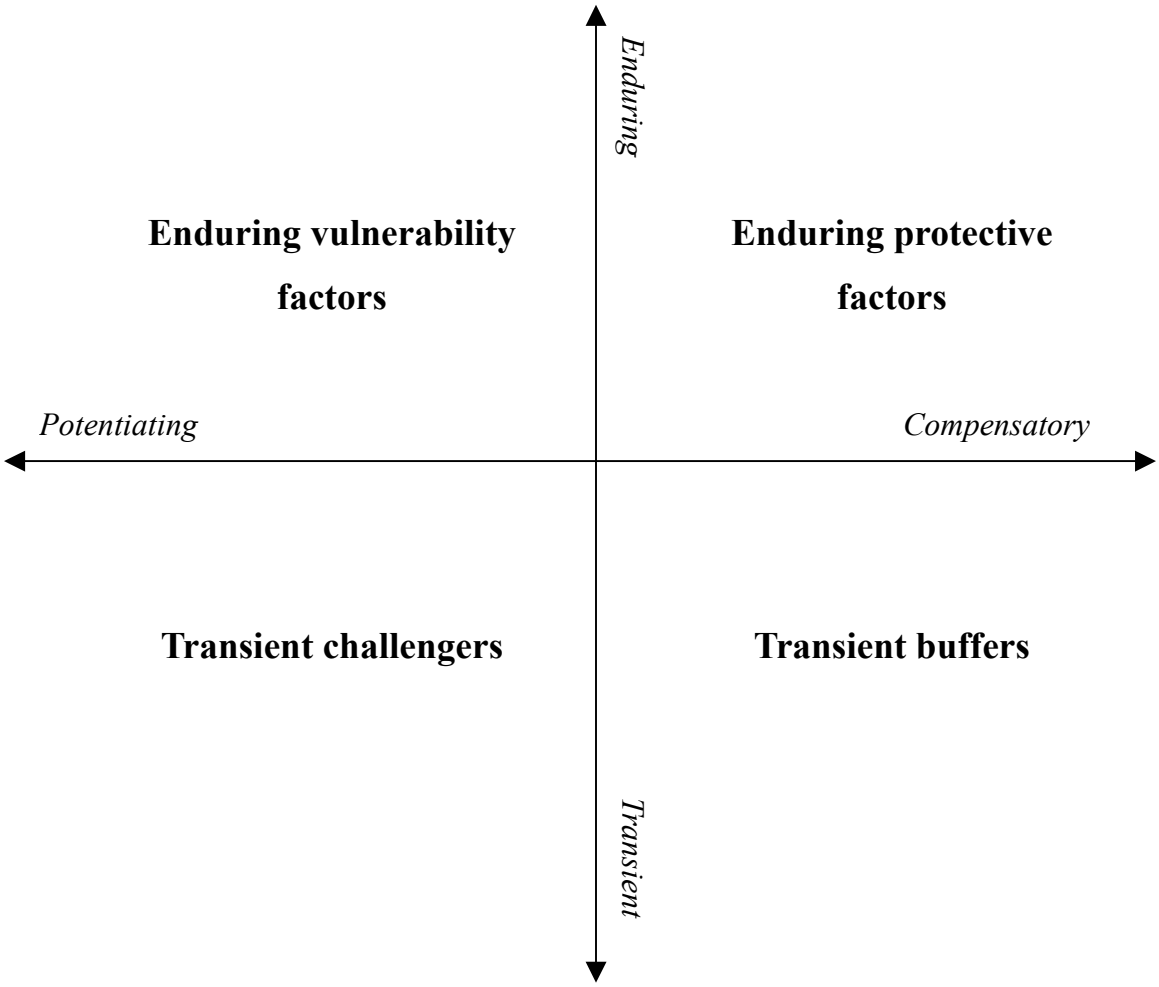


Figure 1 Risk factor space in transactional-ecological model

The *transient challengers* are conditions and stresses that last a relatively short period of time and may increase the likelihood of child maltreatment. They include, for example, the loss of job or loved one, physical injury or illness, legal difficulties, marital or family problems, discipline problems with children, and the emergence of a child into a more difficult developmental stage (Cicchetti & Lynch, 1993).

The *enduring protective factors* include those risk compensating factors that last permanently. Examples of these compensating factors are a parent's own history of having nurturing parents, a secure and quality intimate relationship between the parental figures, and supportive family members and relatives (Cicchetti & Lynch, 1993).

Finally, the *transient buffers* refer to compensating factors that protect a family system from stress for a comparatively short timeframe. Examples include: sudden improvement in financial conditions, periods of marital harmony, and a child's transition out of a difficult developmental stage (Cicchetti & Lynch, 1993).

Several points merit emphasis in evaluating the transactional model of child maltreatment. First, the discretion of risk factors by potentiating-compensatory or transient-enduring factors is independent of the level of human ecology. More specifically, the four distinct factors, as presented in Figure 1, can exist at each level of individual, micro, exo, or macro human ecology system. According to the transactional theory of child maltreatment, a risk pontentiating or compensatory factor first affects whether violence is present at a given level of ecological system where the risk factor exists. Then, effects of the risk factor a the particular level can influence outcomes to other levels within the ecological system (Cicchetti & Lynch, 1993).

Another significant characteristic of the transactional model is that factors proximal environmental system (e.g., microsystem) directly affect the occurrence of child maltreatment and children's developmental outcomes. However, the potentiating factors and compensatory factors at more distal levels of human ecology (e.g., exosystem and macrosystem) also exert their effects on the microsystem (Cicchetti & Lynch, 1993). This

integrative perspective highlights the importance of interactive and situational contexts in child maltreatment.

The transactional model of child maltreatment also incorporates compensatory factors into its framework for child maltreatment. This addition helps researchers explain why some parents exposed to substantial risk factors, such as extremely distressing life events, do not abuse their children while others in the similar situation become perpetrators. Furthermore, the inclusion of compensatory factors into the transactional model helps to explain resiliency in some maltreated children (Cicchetti, Rogosch, Lynch, & Holt, 1993). According to the transactional theory, child maltreatment would not occur unless the potentiating risk factors outweighed the compensatory risk factors (Cicchetti & Lynch, 1993).

In this section, a review of the etiological theories of child maltreatment was provided. Although two earlier etiological models of child maltreatment, psychopathology model and social-psychological model, do not fully explain the problematic behavior, they do provide the building blocks for better understanding child maltreatment. Consequently, the risk factors identified by the previous models are included in the more fully developed ecological model.

As discussed, the two ecological models (i.e., developmental-ecological and transactional-ecological models) of child maltreatment gave a way which incorporates the broader contexts of human ecology within the etiological model of child maltreatment. However, the specific factors associated with the detrimental neighborhood conditions

where child maltreatments are more likely to occur are still unclear (National Research Council, 1993). More to the point, for those neighborhood factors (e.g., poverty rate) allegedly associated with child maltreatment, it is unclear how they affect the occurrence of problematic behavior. In other words, whether and how those neighborhood factors interact with or mediate the effects of individual level factors, for example, are uncertain and warrant further attention. The following section is provided to address the gaps in the current understanding of neighborhood effects on child maltreatment. Based on the ecological framework, more robust neighborhood process models from other research arenas outside of the child welfare literature are applied to the present child maltreatment model.

Looking In-Depth to Neighborhood

In this section, the previous studies of neighborhood effects on child welfare and, more specifically, child maltreatment are reviewed. After a brief discussion of a few exemplary studies on neighborhood effects, theoretical models of neighborhood effects on human behaviors are described. Those models are introduced to test whether they could be applied to explain the association between various neighborhood factors and child maltreatment. The section concludes with three domains of neighborhoods factors (i.e., geographical, structural, and perceptual domains) to better understand the various neighborhood factors allegedly associated with occurrence of child maltreatment.

The impact of neighborhood factors on child welfare range from the very definition of child welfare (Heyman & Slep, 2001; Korbin et al., 2000; Shor, 2000) to

parenting patterns (Caughy, Brodsky, O'Campo, & Aronson, 2001) and children's developmental outcomes and well-being (Shinn & Toohey, 2003). The failure to assess the influence of enduring neighborhood and community contexts on human behavior, referred to as context minimization error, hinders child welfare practitioners and researchers from understanding psychological processes and efforts at social change (Shinn & Toohey, 2003).

Definitions of child maltreatment are often described in relationship to the community context (Grayson, 2001; Korbin, 1997; Korbin et al., 2000). Child neglect, for example, has been defined as a substantial deviation from community standards of care by parents and primary caregivers. Consequently, it has been suggested that the definition of neglect is shaped by the values and norms of the community where the caregivers reside (Dubowitz, Klockner, Starr, & Black, 1998). In this regard, Dubowitz and colleagues emphasized the importance of having a good understanding of how different groups view child neglect differently (Dubowitz et al., 1998).

Community standards and neighborhood norms are important determinant of attitudes on parenting. A community survey study conducted in three low-income neighborhoods about residents' perceptions of parenting attitudes and beliefs indicated that differences in perceptions of parenting associated with individual characteristics were substantially affected by neighborhood characteristics (Caughy et al., 2001). This study suggests that the effect of individual level characteristics on perception of parenting is confounded by neighborhood level factors such as average per capita income, median housing value, and male/female ratio (Caughy et al., 2001).

In a child maltreatment study in the neighborhood of Cleveland, Ohio, Coulton and colleagues (1999) revealed that several neighborhood structural factors, such as impoverishment and child care burden, affect child abuse potential even after controlling for various individual level risk factors. Furthermore, the study shows that the protective effect of parent's education on maltreatment potential fade away when the child care burden factor is high (Coulton et al., 1999). This study was replicated in a relatively affluent suburban area in Maryland and demonstrated findings similar to the original study (Ernst, 2002). Collectively, the studies suggest that high rates of child maltreatment reports are associated with neighborhood structural factors such as poverty and residential mobility (Ernst, 2002).

The importance of structural factors affecting inner-city neighborhood residents' well-being is widely recognized (Caughy, O'Campo, & Brodsky, 1999). It have been suggested that neighborhood level characteristics are associated with wide range of social and individual issues such as domestic violence (O'Campo, Gielen, Faden, & Kass, 1995; Pearlman, Zierler, Gjelsvik, & Verhoek-Oftedahl, 2003), child maltreatment (Coulton et al., 1999; Coulton et al., 1995; Garbarino & Sherman, 1980), cognitive development (Brooks-Gunn, Duncan, Klebanov, & Sealand, 1993), child behavior problems (Brooks-Gunn et al., 1993; Kupersmidt, Griesler, de Rosier, Patterson, & Davis, 1995), and juvenile delinquency (Coulton et al., 1995; Ouimet, 2000; Peeples & Loeber, 1994; Sampson, Raudenbush, & Earls, 1997; Simcha-Fagan & Schwartz, 1986).

More specifically, Based on their own previous neighborhood research projects, Caughy and colleagues (1999) asserted that there is both a direct and indirect influence of

neighborhood economic and social processes on the health and well-being of residents. This study (Caughy et al., 1999) offers insight into how neighborhood research can inform policy development and program implementation in the service for children and families. The authors admit, however, that significant progress remains to be made to achieve a solid understanding of the processes.

To address the shortcomings in understanding how neighborhood factors specifically affect child maltreatment, four process models (i.e., social disorganization theory, collective efficacy model, social stress model, and community institutional resource model) of neighborhood effects are reviewed. Although these do not directly originate from child maltreatment literature, a review of these previous models is worthwhile for this study because it could help build a neighborhood process model in the context of child maltreatment.

Process models of neighborhood effects

The finding that various neighborhood factors affect child welfare is broadly supported by the literature. For example, several aggregate level studies found that neighborhood child maltreatment rates were correlated with a number of neighborhood characteristics such as economic disadvantage and child care burden (Coulton et al., 1999), socioeconomic status (Deccio, Horner, & Wilson, 1994; Garbarino & Kostelny, 1992), high rates of female-headed family (Coulton et al., 1995), and social support (Garbarino & Sherman, 1980). Furthermore, these neighborhood factors are correlated with specific types of child maltreatment (Drake & Pandey, 1996). These correlations

between neighborhood factors and child maltreatment are now widely recognized by child welfare policy makers (U.S. Advisory Board on Child Abuse and Neglect, 1993).

However, the explanation as to why and how the neighborhood factors are related with child maltreatment is quite limited. While limited, there are a few attempts to explain the process of the association between the neighborhood factors and child welfare in general (e.g., Brooks-Gunn et al., 1993; Caughy et al., 2001; Caughy et al., 1999; Duncan & Raudenbush, 1999; T. Leventhal & Brooks-Gunn, 2000; Turley, 2003). Furthermore, although they do not specifically address child maltreatment, there are several theoretical models that attempt to explain the process through which the neighborhood conditions affect various individual level outcomes such as juvenile delinquency (Simcha-Fagan & Schwartz, 1986), community crime (Sampson & Raudenbush, 1999), and domestic violence (Pearlman et al., 2003).

The following sections offer brief introductions to four process models of neighborhood effects that can be applied to explain the association between neighborhood level factors and occurrence of child maltreatment.

Social Disorganization Theory

Community social disorganization theory is one of the few attempts to explain the mediating process of neighborhood factors to child welfare. The theory was first introduced by Shaw and McKay (1942) as an explanatory model for delinquency and crime in poor urban neighborhoods. It hypothesizes that neighborhood structural factors such as ethnic heterogeneity, residential instability or mobility, poverty, and concentrated

single parenthood are the important factors explaining lack of social organizations in the community.

Since social organizations are viewed as maintaining internal control and public order, these factors are thought to be associated with violent crime and other problems even after individual economic and demographic characteristics are taken into account (Sampson et al., 1997).

Collective Efficacy Model

Recently, Sampson and colleagues articulated the theory of social disorganization to generate the concept of collective efficacy (Sampson & Raudenbush, 1999; Sampson et al., 1997). Collective efficacy is "defined as social cohesion among neighbors combined with their willingness to intervene on behalf of the common good" (Sampson et al., 1997, p918) and is associated with reduced violence.

In contrast to focusing on formal and external actions and institutions (e.g., police forces, school) in traditional community social disorganization theory, collective efficacy perspective puts more emphasis on the role of informal mechanisms such as monitoring spontaneous play groups among children, reducing truancy, drinking, vandalism, or a willingness to intervene to prevent public space disturbance (e.g., graffiti, fighting, loitering) (Sampson et al., 1997). However, since the focus of collective efficacy relies mostly on activities that can be observable in public space, this model may have limited explanatory power for domestic violence and child maltreatment, which are often not readily visible in public (Sampson & Raudenbush, 1999).

Social Stress Model

The social stress model emphasizes the negative relationship of social stress with physical, mental, and educational outcomes (Shinn & Toohey, 2003). In a neighborhood study conducted using zip codes, for example, the aggregated perception of neighborhood problems was associated with poor mental health even after individual level measure of community problems were taken into account (Hendryx & Ahern, 1997).

More seriously, perceived neighborhood danger limits the residents' accessibility to community resources and healthy relationship. For instance, in a qualitative neighborhood study, a mother stated that she had to stop her daughter's after-school program due to increased concerns about child safety when she came back home after dark (Caughy et al., 1999).[4]

Unlike community social disorganization theory which focuses more on publicly observable disturbances, the social stress model attempts to explain neighborhood effects on human behavior with more emphasis on the residents' perception of their neighborhood environment (Ross & Jang, 2000; Shinn & Toohey, 2003).

Community Institutional Resource Model

Another explanation of the mediating effect of neighborhood factors is the neighborhood institutional resources perspective (Jencks & Mayer, 1990; T. Leventhal & Brooks-Gunn, 2000). This theory was also introduced as an attempt to explain why the

[4] Environmental stress model introduced environmental stressors such as pollution, noise, and crowdedness into the stress model. See Wandersman and Nation (1998) for review.

children who were raised in more affluent neighborhoods have better outcomes in, for example, educational and economical achievement later in life. Community resources in this model range from schools, libraries, and police forces to parks, community centers, and various community services that promote healthy development (T. Leventhal & Brooks-Gunn, 2000). The availability and quality of these community resources is also important in this model (Coulton et al., 1999).

The focus of institutional models is primarily on adults who work in schools, police forces, and other neighborhood institutions. The theory assumes, for example, that schools in affluent neighborhoods are more likely to hire better teachers than those in economically disadvantaged neighborhoods, which, in turn, substantially affects the quality of education that students receive (Jencks & Mayer, 1990).

This section presented four process models of neighborhood effects on human behavior: (1) social disorganization theory, (2) collective efficacy model, (3) social stress model, and (4) community institutional resource model. While these models are valuable in explaining the association between various neighborhood factors and occurrence of child maltreatment, each model has a distinct focus of its own. As discussed, the collective efficacy model and social stress model put more emphasis on the residents' perception of their neighborhoods whereas the social disorganization theory and the community institutional resources model emphasize structural factors.

Despite their explanatory contributions, no single theory provides a fully developed framework. More specifically, none of the models include all the essential

components of neighborhood factors that relate to various social and behavioral outcomes such as child maltreatment.

The next section presents the limitations of the existing neighborhood frameworks and offers a new framework for understanding the role of neighborhood factors. Three domains of neighborhood factors: (1) geographical domain, (2) structural domain, and (3) perceptual domain, are introduced to more comprehensively address the neighborhood factors associated with child maltreatment.

Three Domains of Neighborhood Factors

The four neighborhood process models (i.e., social disorganization theory, collective efficacy model, social stress model, and community institutional resource model) reviewed in the previous section are frequently applied to the studies of the relationship between neighborhood context and human welfare (e.g., Coulton et al., 1999; T. Leventhal & Brooks-Gunn, 2000; Shinn & Toohey, 2003). For example, Shinn and Toohey (2003) included the four models in their review on how neighborhoods and community settings are associated with human welfare[5]. However, these neighborhood process models and neighborhood factor measures suggested by each model are not without their limitations.

First, both the emphasis and measures differ among the models. While each neighborhood model provides a unique contribution to understanding the association

[5] In this study, the social disorganization theory and collective efficacy model were combined into a social disorganization/norms/collective efficacy model (Shinn & Toohey, 2003).

between the characteristics of neighborhood and various behavioral and psychological outcomes, these models need to be integrated in order to capture all the essential factors of neighborhood effects on child maltreatment. As previously noted, some models (i.e., social disorganization theory and community institutional resources model) emphasize the role of compositional measures whereas others (i.e., collective efficacy and social stress models) stress the psychological processes of residents. However, none of the existing models succeed in taking these two distinct, but compensatory, domains into account at the same time.

A second limitation of the models is their failure to address geographical consideration in the analysis of neighborhood impact. Although frequently used interchangeably, "neighborhood" has a very different meaning from "community/" One of the main differences is that "neighborhood" requires geographic proximity while "community" does not necessarily (Barry, 1994). In this regard, neighborhood, as a geographical reference, needs to be recognized when analyzing neighborhood factors that affect child maltreatment and its outcomes. To date, the literatures using neighborhood process models has not paid enough attention to the geographical boundaries of neighborhoods.

This study proposes that three domains of neighborhood factors: (1) geographical, (2) structural, and (3) perceptual domains must be incorporated into any examination of neighborhood effects on child welfare. Although these domains tap distinct dimensions of neighborhood factor measures, they are not mutually exclusive. Indeed, they represent separate, but complimentary facets of neighborhood construct.

Geographical domain

One difference between the concept of neighborhood and community is in that the latter is a social unit while the former is a geographic determinant (Coulton et al., 1996). Determining neighborhood boundaries is a critical issue in assessing neighborhood contexts (Shinn & Toohey, 2003). However, drawing a line within a spatial locality to define a discrete neighborhood is not an easy task.

The plethora of studies using community social disorganization theory (Bursik & Webb, 1982; Fruedenburg, 1986; Sampson, 1991) reveals numerous ways to define the geographic elements of a neighborhood. Given the multitude of choices, experts have offered guidelines on choosing the most appropriate unit of analysis for determining the parameters of a neighborhood. For example, Sampson's study (1991), which examines the effect of residential stability on social cohesion used two different geographical units of analysis: 526 polling districts and 300 parliamentary constituencies in England and Wales. This study found that "the empirical results were virtually equivalent whether polling districts or constituencies were used" (Sampson, 1991, p. 49). However, the author used polling districts as the unit of analysis because the sample drawn from polling districts is relatively small and more representative of homogeneous local unit which conforms better to the concept of neighborhood or local community (Sampson, 1991).

Census tracts (e.g., Coulton et al., 1996) and zip codes (e.g., Hendryx & Ahern, 1997) have served as the conventional measure for most of the research on the impact of

neighborhoods on children and youth. The size of census tracts varies widely. Each census tract corresponds to from 2,500 to 8,000 people and should average approximately 4,000 people. When first delineated, the census tracts were designed to be homogeneous with respect to basic population characteristics, economic status, and living conditions. Census tracts are used as the primary unit of analysis because numerous types of data, including race, sex, educational attainment, income, school enrollment, housing characteristics, and housing value, are readily available.

Although people's definitions of their neighborhoods is unlikely to conform to census boundaries, using census tracts to determine neighborhood boundaries is considered as an acceptable starting point (Shinn & Toohey, 2003). A study of residents' perception of neighborhood boundaries found that residents' self-defined boundaries were close in size to census tracts but typically included portions of at least two census tracts and three block groups (Coulton, Korbin, Chan, & Su, 2001). Furthermore, size of census tracts is large enough to provide a reliable aggregated measure of characteristics, yet small enough to be considered as a neighborhood (Coulton et al., 1995).

However, it has been pointed out that the residents' perception of neighborhood boundaries does not necessarily correspond to the census tracts. Block groups have been suggested as a primary unit of analysis and an alternative to the census tracts (Coulton et al., 1996; Douglas D. Perkins & R. B. Taylor, 1996; Taylor, Gottfredson, & Brower, 1984). Blocks are small areas typically bounded on all sides by streets. Since the size of block groups, clusters of blocks, is within walking distance and within a

census tract, it may represent the most immediate influence on families with young children (Coulton et al., 1996). However, due to the issues of confidentiality, data available on block group level are relatively limited when compared with those of a census tract. Furthermore, there has been controversy regarding whether these units of analysis conform to the space that is meaningful to residents (Tienda, 1991).

Despite the controversy regarding the spatial definition of neighborhoods, geographical boundaries are still necessary in examining neighborhood or community factors (Coulton et al., 1996). Since the geographical unit serves as a possible, if not only, unit of analysis in the neighborhood context, it should be one of the primary considerations in the early stage of designing neighborhood research (Ouimet, 2000).

Although a critical part of neighborhood research, the geographical domain of neighborhood factors plays its main role in the initial stage of research design, not as a separate variable (e.g., independent variable and/or covariate) in a study model. It is because the issue of a unit of analysis is largely related to decision of the primary sampling units and, therefore, primary sampling frame (Rubin & Babbie, 2001).

However, there are a few other geographical indicators such as urban-rural residence and regional differences (i.e., South, North, East, and West) that can be directly incorporated into child maltreatment etiological model as specific risk factors. The significance of these indicators is illustrated by a study comparing rural and urban perceptions of child neglect, which found that rural respondents were only slightly more likely to report child neglect than urban respondents (Craft & Staudt, 1991). A more recent study found that incidence rate of emotional and physical abuse is higher in rural

regions compared to urban (Sebre et al., 2004).

In another study, which focused on the relationship of child maltreatment and ethnicity, reported that the relationships between child maltreatment and ethnicity were not altered when rural-urban differences were taken into account (Lauderdale, Valiunas, & Anderson, 1980). However, they also found that there were substantial differences by residence types within and across ethnic categories. The researchers concluded that their study indicates that the degree of urbanization should be incorporated in empirical investigations of child maltreatment (Lauderdale et al., 1980).

Structural domain

Traditional approaches to neighborhood effects on child maltreatment have largely focused on examining the association between socio-economic variables of each neighborhood unit and the incidence rate of child maltreatment (e.g., Deccio et al., 1994; Garbarino & Sherman, 1980). The socio-economic variables included in the studies were: average income, racial concentration, occupational distribution, average education level, unemployment rate, proportion of female-headed households, residential mobility, and neighborhood development index (Garbarino & Sherman, 1980). These variables can also be related to the structural aspects of neighborhood factors (Coulton et al., 1995).

Archival information such as census data is widely used to incorporate neighborhood level factors into a community study design (Shinn & Toohey, 2003). After extensive review of the literature on neighborhood effects on children and adolescent outcomes, Leventhal and Brooks-Gunn (2000) found that three dimensions of

neighborhood factors have been most frequently used across all the studies. These dimensions were retrieved from census data on income or SES (affluence/high SES and poverty/low SES), racial/ethnic heterogeneity, and residential mobility, However, some experts argue that it is necessary to look beyond census data to fully understand how neighborhood structural factors affect outcomes for families and individuals (T. Leventhal & Brooks-Gunn, 2000).

Environmental data such as air and water pollution have also been proposed as important neighborhood factors for the purpose of certain studies. Although its precise process is unclear, environmental pollution allegedly disrupts human neurological control mechanisms and increases violent crime rates (Motluk, 1997; Unknown, 1997)

Other administrative data on neighborhood factors include: (1) crime data available from police departments (e.g., Sampson et al., 1997); (2) medical records such as low birth weight rate and level of prenatal care use in a community available via departments of human and social services (e.g., O'Campo, Xue, Wang, & Caughy, 1997) or other supplementary census data, such as 1990 United States Census of Population and Housing (e.g., Roberts, 1997); and (3) data on child maltreatment rates available through departments of human and social services (e.g., Coulton et al., 1995; Korbin & Coulton, 1997).[6]

[6] Coulton & Hollister (1998) provided a good resource for finding out neighborhood measures.

Perceptual domain

While it is important to recognize neighborhood as a geographically defined unit, the residents in the geographically defined unit should have shared experiences and feeling of social cohesion. In contrast to standardized statistical definitions of neighborhood areas, Coulton and colleagues (1996) suggested that phenomenological and interactional information be used as the basis for defining neighborhoods. Phenomenological level information enables one to probe a sense of the boundaries that are personally meaningful to each resident in a neighborhood. Observed or perceived patterns of social interaction among residents is used to generate neighborhood boundaries based on interactional information. Using, for example, friendship patterns and daily activities as indicators, this approach is well suited to address the research questions in which interactional patterns are the primary concern (Coulton et al., 1996).

Whereas most of the previous studies of neighborhood factors' impacts on maltreatment focus on neighborhood compositional indicators (e.g. neighborhood impoverishment, ethnic heterogeneity, and/or unemployment rate), a myriad of neighborhood studies reveal that there are distinct, but intercorrelated, factors that are associated with the neighborhood context of young children (e.g., Coulton et al., 1996). In a local neighborhood study on child maltreatment, Coulton and colleagues measured residents' aggregate perception of the quality of their neighborhood and included it in their model to explain the child maltreatment potential of urban residents (Coulton et al., 1999).[7]

[7] In this study, however, those measure of residents' perception of neighborhood quality,

The relationship between residents' perception of neighborhood disorder of and level of fear and mistrust was explored (Ross & Jang, 2000). Rather than measuring publicly observable indicators of social disorder, Ross and Jang (2000) used a series of questions to ask residents about their perceptions of their neighborhood's physical and social disorder. Residents were asked to rate the degree to which a series of descriptions represented their neighborhood. These statements include: "My neighborhood is clean"; "My neighborhood is noisy"; "Vandalism is common in my neighborhood"; "There are too many people hanging around on the streets near my home"; and "There is too much drug use in my neighborhood." In this study, they found that residents with higher levels of perceived neighborhood disorder were significantly more fearful of victimization and less trusting of other people (Ross & Jang, 2000). In the context of child maltreatment, these outcomes make the residents less likely to build a social support network in the community, which is an important protective factor of child maltreatment.

Measuring the perceptual domain of neighborhood is different from geographical and socioeconomic domain to the extent that the unit of observation is different from unit of analysis in it. For example, while individual residents participate in the process of measuring perceived safety in their neighborhood, perceived safety should be aggregated, treated as neighborhood level indicator, and incorporated into the framework neighborhood study. In this specific example, the individual respondent is both the unit of observation, and a possible unit of analysis, but the overall unit of analysis for the study is the neighborhood. In sum, the aggregated measure of perceived neighborhood

---

facilities, disorders and lack of control of children were not significantly associated with abuse score over and above the effects of individual level predictors.

safety, such as mean of individual ratings of perceived safety over a neighborhood, represents the neighborhood level indicator.

Conceptual Framework of the Study

This section describes the conceptual framework for the study. This section explains the overall conceptual framework only while specific questions about how factors in the model are measured is described in Variables & Measurement section of the next chapter. Analytical framework of the multilevel model (MLM) that is used to test the conceptual model of this study is not explained here but described in the Data Analysis section of Chapter III.

In the ecological theory, each lower level unit is embedded in a higher-level system: individual in family[8]; family in neighborhood; and neighborhood in society and culture. The nested structure of the ecological system is depicted in Figure 2, which is a conventional way of displaying Belsky's (1980) ecologically integrative model of child maltreatment (National Research Council, 1993). Figure 3 illustrates a conceptual model in which a set of risk and protective factors affecting human behavioral outcomes such as child maltreatment are assumed to interact across four different levels of the ecological system. To highlight the inter-relationship among individual and family level factors, levels are separated from one another and the inter-relationship between the levels are

[8] Due to the data structure of the Add Health study regarding child maltreatment, the primary unit of analysis is family/household and, thus, nested structure of individual in family is not captured in this study. Thus, the boundary between individual and family systems is drawn using dotted line in Figure 2.

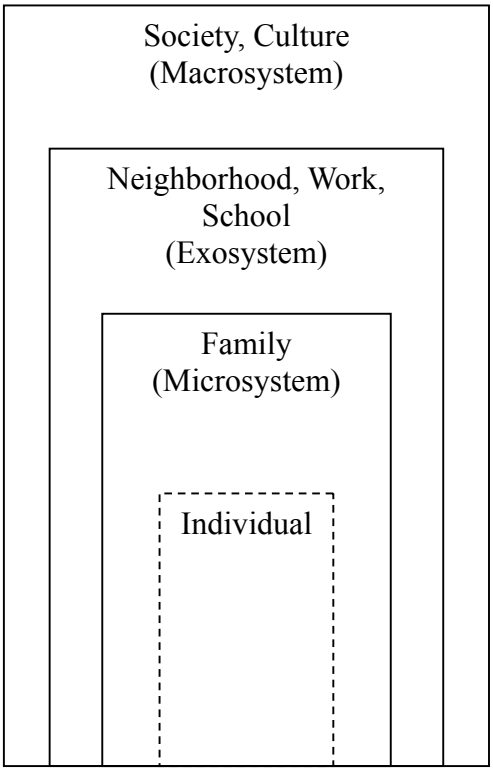


Figure 2 Ecological framework

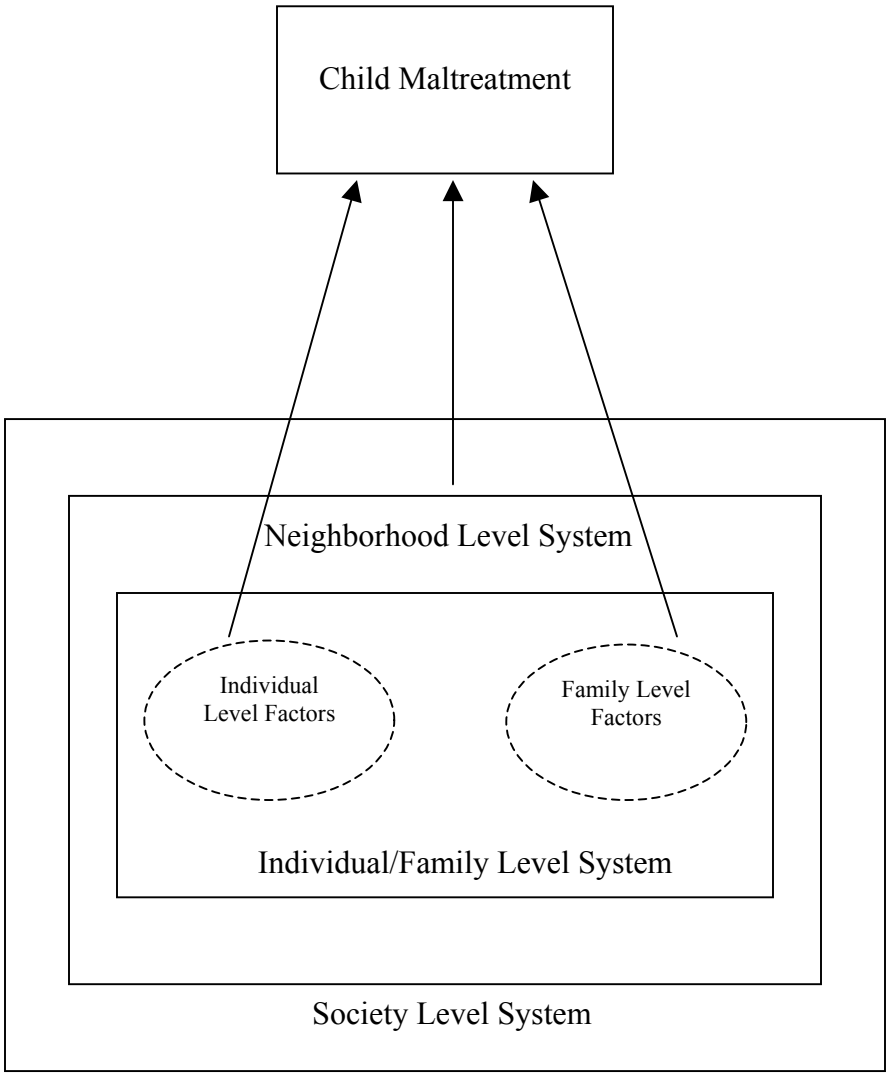


Figure 3 Multilevel child maltreatment model in ecological framework

postulated. Also, the multilevel structure, where the individual and family level factors are nested in a broader neighborhood context, is illustrated by placing the individual and family factors into the neighborhood system in Figure 3. In this baseline model, risk and protective factors from each level exert their impact on child maltreatment and one another.

Figure 4 presents the proposed conceptual framework, the multi-level structure of the child maltreatment model, that is tested in this study. Based on the ecological framework, the individual, family (microsystem), and neighborhood (exosystem and macrosystem) are incorporated into the model. In other words, it is hypothesized that the individual, family, and neighborhood level risk factors affect the incidence of child maltreatment directly. These direct effects of individual/family and neighborhood are depicted using arrows from each level to child maltreatment, as displayed in Figure 4.

Neighborhood level factors are further hypothesized to moderate the relationship between the individual and family level factors and child maltreatment. In other words, the interaction or moderation effect of neighborhood level factors is postulated to examine whether the effects of individual and family level risk factors of child maltreatment are altered by different neighborhood conditions. More specifically, both child and parent factors are incorporated into the individual level model as separate factors. The child factor is included into the model to highlight the parent-child interactive nature of child maltreatment (Parke & Collmer, 1975; Sameroff & Chandler, 1975; Sidebotham, Heron, & The ALSPAC Study Team, 2003). This cross-level interaction, or moderation effect, is illustrated by thick solid arrows drawn from

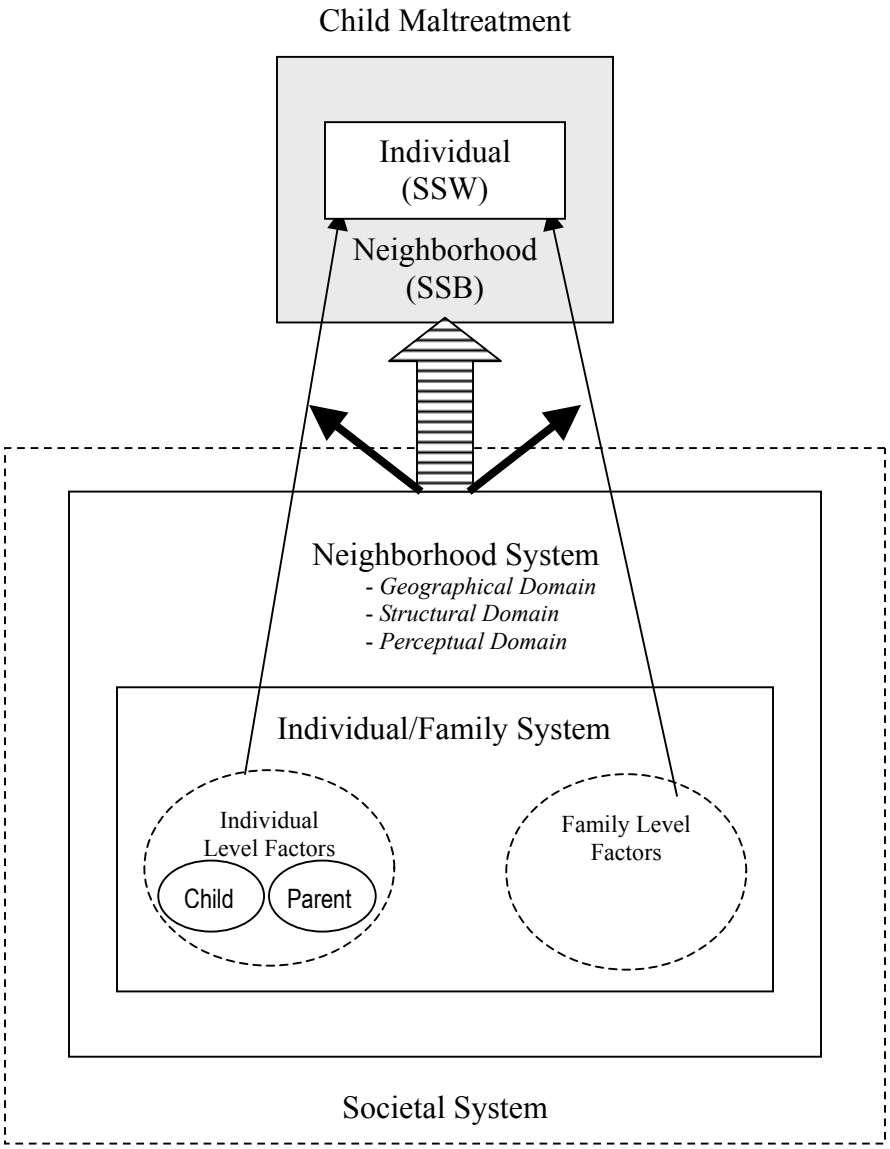


Figure 4 Conceptual child maltreatment model proposed in this study

neighborhood factors to the arrows from individual/family factors to the dependent variable representing individual/family factors' effects on child maltreatment in Figure 4.

Quite obviously, individual level factors exert the most proximal, or direct, effect on the occurrence of child maltreatment. Parents' perceptions about their neighborhood, although measured individually, are integrated into the neighborhood model as an aggregate construct, which serves as the perceptual domain of neighborhood factors.

Family level risk factors were also included in the model. Family structure, number of children in a family, and parental relationship are incorporated into the family level risk factors. Family level risk factors are assumed to exert their impact on child maltreatment directly and indirectly as well via affecting individual level risk factors.

Neighborhood level factors in the model are separated into geographic, perceptual, and structural domains as previously described. In this model, neighborhood level factors are postulated as moderating the effect of both individual and family level risk factors of child maltreatment. Moderation in this context means that the effects of individual level risk factors to child maltreatment are altered by the neighborhood condition in which child and parent reside. Those moderation effects, or interaction effects, are depicted using the dotted arrows in Figure 4.

Neighborhood level factors are hypothesized to exert their impacts on a neighborhood's overall prevalence rate of child maltreatment, not on individual's risk of abusing his/her child. This assumption is consistent with the ecological theory of child maltreatment that neighborhood characteristics are most likely to influence child maltreatment through the pressures they place on the family and the consequent stress

they create (Belsky, 1980). This assumption of a neighborhood's mediating effect is delineated by the shaded wide arrow from neighborhood level factors to child maltreatment in Figure 4.

Three neighborhood level domains are described in the following section. The perceptual domain in this study is measured by several indicators of residents' perceptions about the neighborhood of residence. To construct the neighborhood level measure of the perceptual domain, aggregated values of individual responses for each neighborhood unit are computed and incorporated into the model. Perceptions of neighborhood networks, happiness of living in the neighborhood, perceived safety in the neighborhood, and perceived neighborhood resources are included in this domain.

The association between various socio-economic characteristics of neighborhoods and the prevalence rates of child maltreatment in the neighborhood is now well documented (Deccio et al., 1994; Garbarino & Sherman, 1980). In this study, those more macro level socio-economic and demographic indicators of neighborhoods are included in the structural domain of neighborhood factors. Indicators included in this domain are ethnic heterogeneity, residential mobility, average socioeconomic status, proportion of single household, housing quality, and violent crime rate.

The geographical dimension of the neighborhood factor is measured by regional location and urbanity. This dimension is mainly related with the societal and cultural level indicators. While largely correlated with other dimensions of neighborhood factors, the geographical domain makes unique contributions that are not explained by either structural or perceptual domains. For example, since the legal definition of child

maltreatment varies widely across states, residents' perception of child maltreatment is greatly influenced by where they reside.

CHAPTER III

METHODOLOGY

This chapter describes the methods used to test the model and answer the research questions. It is comprised of three sections: (1) research questions; (2) research design; and (3) data analysis procedure. The chapter begins by providing a list of the main research questions to be addressed by this study.

In the research design section, the Add Health project, from which data is used for this dissertation study, is described in detail. The research design of the Add Health study, including sampling procedure, population of interest, data collection procedure, and main research questions are reviewed as needed for the purpose of better understanding this dissertation study. The Add Health study description is followed by a description of the measurement models adopted in this secondary analysis study. The discussion includes the operational definition of each dependent variable, independent variable, and other relevant covariates. Multilevel statistical models used to disentangle the complex relationship between the variables of interest are explained in the data analysis procedure section.

Research Question

Question 1-1: Does the likelihood of child maltreatment vary significantly across different neighborhoods after taking the effect of individual and family level risk factors into account?

Question 1-2: If it does, which neighborhood level variables are significantly associated with neighborhood level variation of child maltreatment prevalence rates?

Question 2-1: Do the effects of individual and familial level factors on parents' risk of abusing their children vary significantly across neighborhood units?

Question 2-2: If they do, which neighborhood level conditions are significantly associated with the variation in the individual and family level factors' effects?

Question 3: Is the model for parents' risk of neglecting their children different from that of physically abusing their children? If they are, in what ways are they different?

Question 4: Among the existing process models of neighborhood factors (i.e., social disorganization model, collective efficacy model, institutional resource model, and social stress model), which is most effective in explaining the neighborhood effects on child maltreatment and its outcomes?

Research Design

Data: National Longitudinal Study of Adolescent Health (Add Health)

In this secondary data analysis, data from the Add Health study are utilized. A few other existing data sets were also considered for this study. A local data set examining the neighborhood and household factors in the etiology of child maltreatment in Cleveland, OH (Coulton et al., 1999) was first examined but not considered further for two reasons. First, this study was done in local neighborhoods of Cleveland so that some important neighborhood level variables such as urbanity have very limited variation in

this study. Also, the regional location variable in the geographical domain of neighborhood factors, for example, cannot be incorporated into the model because that variable measures a broader context than a city. Second, there was no child neglect measurement readily available in the data set[9]. Although it was later discovered that there is a way to construct the neglect scale using the data set, the neglect subscale in the Child Abuse Potential inventory is not successfully cross-validated yet (Milner, 1986).

Two other national level data sets were examined: Longitudinal Studies of Child Abuse and Neglect (LONGSCAN) (Runyan et al., 1998) and National Survey of Child and Adolescent Well-Being (NSCAW) (NSCAW Research Group, 2002). However, the LONGSCAN data was not recommended for this study because of some limitations inherent in the research design of the study. For example, the sample recruitment strategy in one of the study sites yielded a sample in which most subjects lived in just a small number of neighborhood units, providing virtually no variation in neighborhood characteristics of the study site.

The NSCAW data set was considered promising for this study but was not selected for several reasons. First of all, the NSCAW study's target population was all children who were subjects of child abuse and neglect investigations or assessments conducted by Child Protective Services (CPS). In other words, the findings from the NSCAW study can only be generalized to those who are in higher risk of child maltreatment. Secondly, there were some practical issues that are related with prospective

[9] Although the original study utilized the Child Abuse Potential (CAP) inventory (Milner, 1986, 1994), which includes child neglect measurement portion of it, the child neglect measurement was not included in the data set.

time line to obtain the NSCAW data set for the current study. For example, the nature of this dissertation (i.e., neighborhood identifier for each case included in the study is needed) requires the data set that is in the highest level of restriction in the NSCAW's data release policy. Since the NSCAW research team has never received any request for releasing the data at the highest level of restriction, the time line for getting the data set was not predictable.

The Add Health study was eventually selected for this study over the others for two main reasons. First, the Add Health study incorporated the multilevel design in its study design as the Add Health study seeks to examine how various social contexts affect adolescents' health and risk behaviors. Second, the Add Health data is equipped with abundant neighborhood level contextual variables which can be readily utilized in this dissertation.

Add Health is a nationally representative, probability-based survey of adolescents in 7th through 12th grade in the U.S. schools between 1994 and 1996 (N = 20,745). Add Health was designed to examine the causes of health-related behaviors. Among the exceptional features of its data are the special emphasis on the influence of social context to various types of health related behaviors. This study assumed that families, schools, and neighborhoods play important roles in the lives of adolescents that affect the choices regarding healthy or unhealthy behaviors.

Sampling

The primary sampling frame for the Add Health study was a list of all U.S. high

schools (N = 26,666). From the sampling frame, 80 high schools were systematically selected with probability proportionate to school enrollment size. Also, 52 feeder (junior high and middle) schools, or sister schools, providing students to the selected high schools were randomly selected with probability proportionate to percent of high school's entering class coming from that feeder. School enrollment size, school type, region, location, and percent White were taken into account during the stratification procedure.

This dissertation utilizes only a portion of the total respondents who had at least one child at the Wave III data collection point (N=2,960). Although only a portion of the entire Add Health data set was analyzed, the chosen sub-sample is considered as representative of the total study population of early adults who had at least one child in their age between 18 and 26 at the time of data collection. According to the applications programmer of the Add Health project, the appropriate weights are associated into the data analysis process in order to obtain the results that can be generalized to the national population of the age range (K. Chantala, personal communication, July 29, 2003).

Data Collection

The Add Health study is a longitudinal study with participants interviewed in three waves: Wave I (i.e., baseline), Wave II (i.e., 1 year post-baseline), and Wave III (i.e., 6 years after Wave II). This multi-wave data collection design enabled the study to measure the influence of the adolescents' experiences at one time on their behavior and its consequences at another time directly, avoiding the potential confounds of respondents' memories and reconstructions of past events. The Add Health study

included surveys of students, parents, and school administrators.

Wave I

School-Administrator Questionnaire: Administrators from the participating schools were asked to complete the School-Administrator questionnaire, a self-administered questionnaire during the first study year. This School-Administrator questionnaire asked information on school policies and procedures, teacher characteristics, health services, and student body composition.

Adolescent In-Home Questionnaire: A total sample size of 20,745 was selected. including special over-samples of ethnic groups, disabled students, genetic samples (i.e., identical and fraternal twins, full siblings, half siblings, and step siblings), and saturation samples (i.e., all students from 16 schools) as well as core sample chosen with probability proportionate to size and a fixed number of students from each school. The In-Home questionnaire included questions about health behavior, peer networks, criminal activities, and several other issues. All adolescents in the sample were asked to complete the In-Home questionnaire, which involves a face-to-face interview. The interviews were conducted between April 1995 and December 1995 and yield a 78.9% response rate.

Parent In-Home Questionnaire: An interviewer-assisted questionnaire was administered to one parent of each respondent who completed the In-Home questionnaire of Wave I. The mother or female-guardian had the priority for the selection because they were considered to be more familiar with relevant information such as the schooling, health status, and health behaviors of their children. The interview included information

about communication about sex, expectations and perceptions of the adolescent's behavior, marriages, behaviors specifically related to health, and socioeconomic status. The overall response rate for the parent questionnaire was over 85%.

Adolescent In-School Questionnaire: In addition to the In-Home Questionnaire, adolescents were also surveyed in the school setting. Over 90,000 adolescents were sampled from the 132 schools for the In-School questionnaire of Wave-I. This questionnaire asked questions about student and parent background and health-related information. The overall response rate for the In-School questionnaire was over 90%.

Wave II

School-Administrator Questionnaire: As a follow-up data collected at Wave I and to get information about dress codes and security procedures, the School-Administrator Questionnaire was administered again in the following year. Only two administrators failed to complete the questionnaire and several schools completed more than one response.

Adolescent In-Home Questionnaire: The sample for the In-Home questionnaire of Wave II was generally the same as the Wave I. The important differences are: (1) 12th graders were excluded unless they were in the genetic samples; (2) the disabled sample was not tracked; and (3) 65 participants were added to the genetic sample. The content of the Wave II Adolescent In-Home Questionnaire was essentially the same, but additional questions about sun exposure, nutrition, height, and weight were added. The response rate for this questionnaire was 88.2%, which represents 14,738 respondents.

Wave III

Data collection for Wave III was conducted 6 years after wave II. Wave III was designed to gather data on the transition from adolescence to young adulthood. Concentrated efforts were made to relocate the original Wave I respondents. Interviews with 15,197 original respondents were completed at wave III. While the original respondents of Wave I who were outside the U.S. or deployed overseas in military service were excluded from the Wave III, special efforts were made to interview the respondents who were in correctional facilities.

In-Home Questionnaire: The Wave III In-Home Questionnaire was intended to obtain information about relationship, marital, childbearing, and educational histories, and up-to-date key labor force events. Since the respondents were older and, accordingly, their social contexts were assumed to be different than those of previous waves, special emphases were placed to provide data on new data relevant to young adult life, such as romantic relationships, family-centered social networks, and their own childbearing.

Supplementary Data

Contextual Data: Reflecting the growing recognition of the contextual effects on the health-related decisions and behaviors, contextual data was constructed by the Add Health project. The locations of most respondents who completed the In-Home questionnaires of wave I and II were identified and geo-coded in order to link them to their census block group areas. Using the 1990 Census of Population and Housing

database, two contextual data, one for each wave, were created and matched with each respondent's identification number. For the Wave I data set, 4,411 different block groups were associated with 20,745 respondents. In Wave II, 14,738 respondents resided in 3,648 different block groups. Variables included in the contextual database included demographic distribution, vital statistics, households, income, poverty status, education, labor force participation, and housing.

Social Network Data: Since the Add Health is based on a clustered design, it was possible to collect extensive social network data. The social network data provide information about a direct link between individuals and the social structure where they are embedded. Networks of peers and friends are one of the most critical social contexts that affect adolescents' health related behaviors.

Complete social network data for most students in 140 schools were collected in the friendship section of the In-School questionnaire. Respondents were asked to nominate up to five male and female friends from the roster of all students enrolled in the respondent's school and in the sister school. Since the nominated friends' ('alter' in social network terminology) identification numbers were recorded, peer networks were constructed and described in detail. The Add Health data set contains a supplementary data set constructed for social network measures both at the ego level and school level.

Response Rate

The overall response rate for Wave I was 78.9%. Based on the number of respondents for the last wave, the response rate for Wave II was 88.2% and 77.4% for

Wave III .

Variables & Measurements[10]

This section describes the specific dependent variables and independent variables, chosen for maltreatment model proposed by this dissertation study. This section includes operational definitions of the variables based on the variables of the Add Health data set. Table 1 summarizes the variables and respective measurements used in the study.

General procedure of scale construction that is utilized in this dissertation is briefly described in the following. It is rarely a case that single item from the Add Health data set is utilized to measure a variable of interest in this study. In this case, a unidimensionality of the items that are deemed to be related to the construct of interest is examined using Cronbach's alpha reliability coefficient. The items that negatively affect the alpha coefficient are excluded from the scale construction. Given the sets of items that have positive contribution to alpha coefficient, factor scores were calculated to create a scale. This method of scale construction is used because it creates a scale that utilizes all items relevant to the construct of interest. This procedure is utilized throughout this study unless specifically described otherwise.

Dependent Variables

In the Add Health data, dependent variables of this study, various types of child maltreatment, are measured by the section asking about children and parenting of the

[10] Section number, section label, and wave number in the original Add Health data set are provided in parentheses throughout this section.

young adult respondents. Four questions *(Section 25: Children & Parenting, Wave III),* which concern respondents' abusive behavior to their own children were utilized. Response categories for each question are "One time," "Two times," "Three to five times," "Six to ten times," "More than ten times," and "This has never happened."

Each question addresses a different type of maltreatment. Neglect is measured by two questions as follows:

- "How often have you left your {child/children} home alone, even when an adult should have been with {him/her/them}?"; and
- "How often have you not taken care of your {child/children}'s basic needs, such as keeping {him/her/them} clean or providing food or clothing?"

These two variables are positively skewed (skewness = 7.11, 2.42) and, thus, dichotomized. Two dichotomized variables are further combined to create a neglect variable that measures whether parents ever neglected their children or not.

Physical abuse is addressed by one question which asks:

- "How often have you slapped, hit, or kicked {your child/any of your children}?"

This variable is also dichotomized due to its skewed distribution (skewness = 4.30). It serves as the study's physical abuse variable.

An additional question asks about the experience with Social Services:

- "How often has Social Services investigated how you take care of your {child/children} or tried to take {your child/any of your children} away from your family?"

The overall child maltreatment variable is created by aggregating and dichotomizing all four variables to measure whether parents ever neglected or physically abused their children, or whether they were investigated by Social Services.

Independent Variables

The series of independent variables used in this study are categorized at the ecological level: individual, familial, and neighborhood. This section lists all the independent variables selected for this study and operationally defines each based on the elements of the Add Health data.

Individual Level Variables

As previously described in the conceptual framework of this study, individual level factors are further divided into two separate factors: child and parent factors.

Child factors

A series of variables probing children's characteristics, which are assumed to elicit parents' abusive behavior, are constructed from the Add Health data set. One general consideration regarding the structure of this data deserves special attention. In the original study, parents were asked about various characteristics of children in their household. Consequently, if there was more than one child in a household, multiple measures were recorded in the Add Health data set. Unfortunately, parents were asked questions about child maltreatment without specifying which child, if there were more

than one, was abused or neglected. In other words, it was impossible to identify which child, if there were more than one, was the victim of the maltreatment. In this regard, the effort to match the incidence of maltreatment with the victims' specific characteristics was compromised. As a result, findings derived from this aspect of the study should be interpreted with caution.

In an attempt to effectively address this limitation in situations where there are more than one child per household, the scores that correspond to the most challenging cases for the parents are selected and used for the further analysis. With the child health measure, for example, the score of the child with the poorest health condition was selected for each household and used for the further analysis because it is assumed that taking care of the child with the poorest health condition, all things being equal, requires more time and efforts for the parents and, consequently, might be more stressful.

Irritability: Six questions *(Section 25: Children and Parenting, Wave III)* asking about child's daily behavioral difficulties were used to construct this measure. They include:

- "When <child> hears an unexpected loud sound, how often does {he/she} cry or become upset?"; (Question 12)
- "How often do you have trouble soothing or calming <child> when {he/she} is crying or upset?"; (Question 13)
- "During the average day, how often does <child> get fussy and irritable?"; (Question 14)

- “How often do you have trouble soothing or calming <child> when {he/she} is upset?”; (Question 15)
- “How often is child demanding and impatient even when you are busy?”; (Question 16) and
- “During the average day, how often does child become unhappy or irritable?” (Question 17)

From the first to third questions were asked only to respondents having a child less than two years of age and the last three questions were asked to those respondents who had a older than age two. The third and sixth questions asked respondents to choose among the frequency categories: “Almost never”; “Once or twice a day”; “A couple of times in the morning or evening”; “Several times a day”; and “Almost every hour,” while the rest of the questions used the response scale: “Almost never”; “Less than half the time”; “Half the time”; “More than half the time”; and “Almost always.”

The reliability of the standardized mean for each group is not satisfactory especially for the group of younger children (alpha (age < 2 group) = .521; alpha (age >= 2 group) = .720). Factor scores were calculated using principal component factors for each child in a household. Uniqueness coefficients, variances unexplained by the factor structure, for the variables in the factor analysis range from .342 to .631. If there were more than one child for a respondent, the largest factor scores for each household was selected and used for further analysis.

Health condition & developmental difficulties: There are a series of questions

(Section 25: Children and Parenting, Wave III) that ask about a child's general and specific health condition. One question was chosen to define the child's general health condition:

- "In general, how good is child's health?" (Question 8)

This question was answered using a 5-point Likert scale ranging from "excellent" to "poor." In case where there was more than one child per respondent, the largest value, or the poorest health, of the children was used in the analyses.

Two other "Yes/No" questions were asked of respondents and included in this measure*:*

- "Does <child> have any physical, emotional, or mental condition that limits or interferes with {his/her} ability to learn?"; (Question 9) and
- "Does {he/she} have a condition that keeps {him/her} from the activities other children {his/her} age do routinely?" (Question 10)

To emphasize the importance of developmental delays (Sidebotham et al., 2003), the study includes two other questions that inquire about whether the child has been diagnosed by his/her doctor as having:

- "Delayed speech or other problems with speaking or understanding" and/or
- "A developmental delay or slowness in learning." (Question 11)

Since answers to these questions are dichotomous, tetrachoric correlation coefficients are examined between the variables and range from .646 to .929. Based on these four dichotomous indicators, a factor score for each child was created and, if there was more than one child for a respondent, the largest factor scores for each household

was selected.

Birth weight: Low birth weight and prematurity are among the most frequently used measures of child factors in child maltreatment literature (Friedrich & Boriskin, 1976; Sidebotham et al., 2003). This study includes questions about a baby's birth weight in pounds and ounces *(Question 5, Section 24: Live Births, III).* A weight of less than 5 pounds, 8 ounces (2,500 grams) is defined as low birth weight. For parents who had more than one baby, the lowest birth weight was selected. Low birth weight was further dichotomized into whether each respondent had any baby with low birth weight.

Parent factors

Being abused as a child: The intergenerational transmission of child abuse is now a well-known, yet controversial, phenomenon in child maltreatment literature (Cicchetti & Rizley, 1981; Ertem et al., 2000; Kaufman & Zigler, 1989). In Add Health data, a section *(Section 29: Mistreatment by Adults, Wave III)* was dedicated to questions tapping the respondents' previous experiences of being mistreated by their parents or other adult caregivers. Questions were asked of the adult respondents in Wave III and each question addressed different type of maltreatment. Neglect was measured by two questions as following:

- "By the time you started 6th grade, how often had your parents or other adult care-givers left you home alone when an adult should have been with you?" (Question 1) and

- "How often had your parents or other adult care-givers not taken care of your basic needs, such as keeping you clean or providing food or clothing?" (Question 2)

Physical abuse was addressed by one question asking

- "How often had your parents or other adult care-givers slapped, hit, or kicked you?" (Question 3)

One question asked about sexual abuse:

- "How often had one of your parents or other adult care-givers touched you in a sexual way, forced you to touch him or her in a sexual way, or forced you to have sexual relations?" (Question 4)

Response categories for each of above questions were: "One time," "two times," "three to five times," "six to ten times," "more than ten times," and "This has never happened."

Two other questions in the section queried the experiences with Social Services:

- "How often had Social Service investigated how you were taken care of or tried to take you out of your living situation?"; (Question 5) and
- "How often had you actually been taken out of your living situation by Social Services?" (Question 6)

The response scale for the questions ranged from 0 times to 60 times.

None of the variables were normally distributed and the skewness values ranged from 1.26 for Question 1 and 39.06 for Question 5. Dichotomous variables for neglected, physically abused, and ever abused were created for further analysis.

Alcohol & drug related behavior: A series of questions were used to measure the respondents' alcohol related behavior *(Section 28: Tobacco, Alcohol, Drugs, Self-Image, Wave III)*. Questions used to measure general alcohol use pattern were:

- "On how many days did you drink alcohol?"; (Question 38)
- "How many drinks did you usually have each time?"; (Question 39)
- "On how many days did you drink five or more drinks in a row?"; (Question 40)
- "On how many days have you been drunk or very high on alcohol?"; (Question 43)

A separate set of questions asked about the respondents' alcohol use are also included. Participants were asked to respond to each statement in terms of, "How many times has been each of following things happened?":

- "You had problems at school or work because you had been drinking" (Question 45);
- "You had problems with your friends because you had been drinking" (Question 46);
- "You had problems with someone you were dating because you had been drinking" (Question 47);
- "You were hung over" (Question 48);
- "You were sick to your stomach or threw up after drinking" (Question 48);
- "You got into a sexual situation that you later regretted because you had been

drinking" (Question 48);

- "You got into a physical fight because you had been drinking" (Question 48); and
- "You were drunk at school or work" (Question 48).

The twelve items show substantial reliability when measured with alpha coefficient (alpha (standardized mean) = .861). Having all of the variables loaded to one factor using principal component analysis, factor scores are calculated. Results of the principal component analysis show that the uniqueness values of one factor structure range from .360 to .852.

Also, a separate set of questions asking problems related to respondents' drug use are included. The questions include:

- "How often did you have problems at school or work because you had been using drugs" (Question 123);
- "How often did you have problems with your friends because you had been using drugs" (Question 124);
- "How often did you have problems with someone you were dating because your had been using drugs" (Question 125);
- "How often did you get into a sexual situation that you later regretted because your had been using drugs" (Question 126);
- "How often did you get into a physical fighting because you had been using drugs" (Question 127); and
- "How often were you high on drugs at school or work" (Question 128).

The reliability among these items (alpha = .788) is also substantially high. A principal component analysis was utilized to create factor scores from these items. Again, when all the variables are assumed to be loaded on one factor, the uniqueness values for the variables in the factor structure range from .456 to .805.

Although there were several equivalent questions that asked about more recent alcohol and drug use, they were excluded because they provided data outside the parameters of this study. More specifically, the dependent variables of this study only addresses whether abuse have ever occurred after the child's birth. Since we do not know when the abuse incidence occurred, it is plausible to associate measure of long-term behavior, rather than recent and short-term, into the etiological model of child maltreatment.

Self-esteem: A modified version of Rosenberg's self-esteem scale (M. Rosenberg, 1989) was used in the original study *(Question 20-23, Section 12: Social Psychology and Mental Health, Wave III)*. Questions included in this study asked whether respondents agreed or disagreed with the following:

- "You have many good qualities?" (Question 20);
- "You have a lot to be proud of?" (Question 21);
- "You like yourself just the way you are?" (Question 22); and
- "You feel you are doing things just about right?" (Question 23).

These questions were answered using a 5-point Likert scale ranging from "Strongly Agree" to "Strongly Disagree."

The reliability of these items (alpha=.762) is considered high. Using a principal component analysis, factor scores were calculated and used for further analysis (Range[uniqueness] = (.402, .453)).

Depression: Depression of respondents was measured using 10 items from the Center for Epidemiologic Studies-Depressed Mood Scale (CES-D) (Radloff, 1977) during the Wave III of the original study *(Question 2, 5-13, Section 12: Social Psychology and Mental Health, Wave III)*.

The reliability of standardized mean of these items was substantially high (alpha = .831) and a principal component analysis was utilized to create factor scores. All the items were loaded on one factor, yielding uniqueness values for the variables ranging from .329 to .784.

Perceived social supports in childhood: In Wave I of the original study, a set of questions were asked regarding the social supports respondents felt they were receiving *(Section 35: Protective Factors, Wave I).* Participants were asked, "How much do you feel that," in terms of the following statements:

- "adults care about you?" (Question 1);
- "your teachers care about you?" (Question 2);
- "your parents care about you?" (Question 3);
- "your friends care about you?" (Question 4);
- "people in your family understand you?" (Question 5);

- "you want to leave home?" (Question 6);
- "you and your family have fun together?" (Question 7); and
- "your family pays attention to you?" (Question 8).

These were measured using 5-point Likert scale from "Not at all" to "Very much."

When aggregated using average of all scores, coefficient alpha indicated that the friends-related question negatively affected the reliability of overall score (alpha (with friend score) = .780; alpha (without friend score) = .788). In order to include the important effect of peer relationship to their childhood, all of eight indicators were used to create the perceived social supports scores in their childhood. The result of a confirmatory factor analysis of the model that included all of eight indicators indicated that the overall fit of the model was neither satisfactory nor unacceptable (CFI = .927, SRMR = .049) (Hu & Bentler, 1999). Factor scores from the model with eight indicators were used to measure perceived social supports in their earlier life.

Age of being a parent: Age of becoming a parent was constructed using a combination of a table of pregnancies *(Section 18: Compiling a Table of Pregnancies, Wave III)* and the respondents' date of birth information *(Section 1: General Introductory, Wave I).*

Employment status (history): Instead of using the current employment status of parents, a variable measuring the respondents' employment history or pattern after

becoming parents was created and used to associate with the child maltreatment behaviors. Respondents were categorized as "consistently employed" if they were employed entire years after becoming a parent, "never employed" if they had never been employed after becoming parents, or "cyclically employed" otherwise after they became parents.

Unwanted pregnancy: A question about the intention to become pregnant was asked in the Section 22: Completed Pregnancies, Wave III. Each respondent's answer to the question was used to measure whether there were any unwanted pregnancies and, consequently, the respondent becomes a parent of a baby from unplanned pregnancies.

Family Level Variable

Parental social supports: The parental support of respondents was measured using different questions regarding parental support and relationships *(Section 3: Parental Support & Relationship, Wave III).* Identical questions were asked of the current and previous residential mother, the current and previous residential father, and the biological mother and father. Examples of questions include:

- "You enjoy doing things with <CRMOM>?"
- "Most of the time, {HE/SHE} is warm and loving toward you."
- "How close do you feel to <CRMOM>?"
- "Has {HE/SHE} given you any money or paid for anything significant for you during the past 12 months? Don't include regular birthday or holiday

gifts."

- "Please give an estimate of this financial help in the past 12 months. Include money given directly to you and the cost of significant items bought for you by <CRMOM>."

In the original study (Section 3: Parental Supports and Relationship, Wave III), the financial help offered by current parents, previous parents, and biological parents were asked in aggregated amounts (i.e., less than $200, $200~499, $500~999, and $1,000 or more). Although the measures of financial help do not exactly represent interval level data, a total sum of the scores from all parental figures was used to create a proxy measure of financial supports.

Perceived closeness to parental figures was measured using three indicators from each of eight parental figures, which includes: current residential parents, previous residential parents, biological parents, and current step parents. It is assumed that there is an order in the significance of relationships among parental figures. Given the assumption of the order in the significance, the relationships were ranked in order of importance, from current parent, previous residential parents, biological parents, to step parents. Perceived closeness with the currently residential parents was, in fact, used if it was available. If this information was not available, the previous residential parents were selected. The same procedure was executed for biological parents and stepparents until valid scores were obtained.

Number of children living in household: To measure how crowded the

residential place is, the number of children living in household was included. Information from the household roster is used to construct the variable *(Section 2: Household Roster and Residence History, Wave III).*

Marital satisfaction and parental relationship: The relationship between the respondent and his/her spouse/partner was measured using a series of questions in the *Section 19: Relationships in Detail, Wave III.* This measure includes:

- "In general, how satisfied are you with your relationship with <PARTNER>?" (Question 119)
- "How much do you love <PARTNER>?" (Question 120)
- "How much do you think <PARTNER> loves you?" (Question 121)
- "Considering what you put into the relationship compared to what you get out of it, and what <PARTNER> puts in compared to what {HE/SHE} gets out, who is getting a better deal in the relationship?" (Question 122)

To separate the effects of a loving relationship between parents from that of violent relationship, one variable measuring loving relationship scores and another for negative or violent relationship scores were created. The average scores of four questions that queried how frequently parents experienced threat, physical violence, sexual violence, and/or injury from the violence were used to create a measure of violent parental relationship. The overall reliability for the four items, using the mean of the standardized items is considerably high (alpha = .882). The averages scores for two questions, which ask how much the respondents love their spouses/partners and how much the respondents

think their spouses/partners love them, were used to create loving parental relationship score. Using the alpha coefficient, the variable is considered substantially reliable (alpha = .756). If a respondent had more than one spouse or partner subsequent to becoming a parent, the mean of the relationship scores were used.

Family structure (Single parenthood): Whether the respondent played a single-parent role in the household or not is constructed using the information from the household roster *(Section 2: Household Roster and Residence History, Wave III)* and relationships *(Section 19: Relationships in Detail, Wave III).*

Neighborhood Level Variables

A contextual dataset was specially constructed by the Add Health project to provide an array of community characteristics by which researchers could investigate the nature of contextual influences for a wide range of adolescent health related behaviors. This contextual dataset was constructed using block group level data in the 1990 Census of Population and Housing for the area of residence reported by respondents at the Wave I data collection point.

Geographical Domain: The urbanity code *(BST90P01)* and regional location were the only indicators readily available in the Contextual Database that were related to geographical domain of neighborhood factors.

Structural Domain: Measures such as ethnic heterogeneity, residential mobility, socioeconomic status, proportion of single parent households, housing quality, and violent crime rate were included in this domain of neighborhood factors.

Perceptual Domain: Wave I *(Section 36: Neighborhood, Wave I)* asked about included a series of questions on how the respondents felt about their neighborhood. This measure was aggregated by the neighborhood unit and used to address the perceptual domain. Questions included in this section were:

- "You know most of the people in your neighborhood." (Question 1)
- "In the past month, you have stopped on the street to talk with someone who lives in your neighborhood." (Question 2)
- "People in this neighborhood look out for each other." (Question 3)
- "Do you use a physical fitness or recreation center in your neighborhood?" (Question 4)
- "Do you usually feel safe in your neighborhood?" (Question 5)
- "On the whole, how happy are you with living in your neighborhood?" (Question 6)
- "If, for any reason, you had to move from here to some other neighborhood, how happy or unhappy would you be?" (Question 7)

The mean of the aggregate responses to these questions was used to create the neighborhood level measure of perceptual domain. One variable was used to measure

neighborhood safety perceived by residents. Another variable, asking residents' use of neighborhood facilities (e.g., physical fitness or recreation center), was used to measure neighborhood resources. The mean of responses to question 1 through 3 in the section was used to measure neighborhood support or network. In addition, the mean of questions 6 and 7 was used to measure perceived happiness or satisfaction with one's neighborhood. Cronbach's alpha for each aggregated measure was .598 and .627, respectively, for neighborhood network and neighborhood happiness.

Table 1 Measurement model for each level of ecological system

Ecological Level	Variable	Questions	Response
Dependent Variable	*Child neglect*	- How often have you left your {child/children} home alone, even when an adult should have been with {him/her/them}? - How often have you not taken care of your {child/children}'s basic needs, such as keeping {him/her/them} clean or providing food or clothing?	Never One time Two times 3 to 5 times 6 to 10 times > 10 times
	Physical abuse	- How often have you slapped, hit, or kicked {your child/any of your children}?	Never One time Two times 3 to 5 times 6 to 10 times > 10 times
	Social Service	- How often has Social Services investigated how you take care of your {child/children} or tried to take {your child/any of your children} away from your family?	Number of times
Individual			
Child	*Irritability*	- When <child> hears an unexpected loud sound, how often does {he/she} cry or become upset? [a] - How often do you have trouble soothing or calming <child> when {he/she} is crying or upset? [a] - During the average day, how often does <child> get fussy and irritable? [a]	Almost never <Half the time Half the time >Half the time Almost always
		- How often do you have trouble soothing or calming <child> when {he/she} is upset? [b] - How often is child demanding and impatient even when you are busy? [b] - During the average day, how often does child become unhappy or irritable? [b]	Almost never Once or twice a day A couple of times in the morning or evening Several times a day Almost every hour
	Health	- In general, how good is child's health?	5-point Likert, Excellent to Poor
	Developmental difficulty	- Does <child> have any physical, emotional, or mental condition that limits or interferes with {his/her} ability to learn?	Yes/No

		- Does {he/she} have a condition that keeps {him/her} from the activities other children {his/her} age do routinely? - Has {he/she} been diagnosed by {his/her} doctor as having delayed speech or other problems with speaking or understanding? - Has {he/she} been diagnosed by {his/her} doctor as having a developmental delay or slowness in learning?	
	Low birth weight	- What was the baby's birth weight?	Pounds & ounces
Parent	*Ethnicity*	- Are you of Hispanic or Latino origin?	
		- Which one category best describes your racial background?	White Black or African American American Indian or Native American Asian or Pacific Islander
	Education	- What is the highest grade or year of regular school you completed?	Years
	Gender	- Interviewer's examination	Male/Female
	Social supports	How much do you feel that: - adults care about you? - your teachers care about you? - your parents care about you? - your friends care about you? - people in your family understand you? - you want to leave home? - you and your family have fun together? - your family pays attention to you?	5-point Likert, Not at all to Very much
	Age being parents	- Month and year in which this pregnancy ended or is expected to end - Respondent's date of birth	Years and months
	Alcohol abuse	- On how many days did you drink alcohol? - On how many days did you drink five or more drinks in a row? - On how many days have you been drunk or very high on alcohol?	None 1 or 2 days in the past 12 months once a month or less 2 or 3 days a month 1 or 2 days a week 3 to 5 days a week every day or almost every day

	- How many drinks did you usually have each time?	Number of drinks
	- You had problems at school or work because you had been drinking - You had problems with your friends because you had been drinking - You had problems with someone you were dating because you had been drinking - You were hung over - You were sick to your stomach or threw up after drinking - You got into a sexual situation that you later regretted because you had been drinking - You got into a physical fight because you had been drinking - You were drunk at school or work	Never Once Twice 3 or 4 times 5 or more times
Drug abuse	- How often did you have problems at school or work because you had been using drugs? - How often did you have problems with your friends because you had been using drugs? - How often did you have problems with someone you were dating because you had been using drugs? - How often did you get into a sexual situation that you later regretted because you had been using drugs? - How often did you get into a physical fighting because you had been using drugs? - How often were you high on drugs at school or work?	Never Once Twice 3 or 4 times 5 or more times
Self esteem	Do you agree or disagree that: - you have many good qualities? - you have a lot to be proud of? - you like yourself just the way you are? - you feel you are doing things just about right?	5-point Likert, Strongly agree to Strongly disagree
Depression	- In the past 12 months, how often have you cried a lot?	Never Just a few times About once a week Almost every day Every day
	During the past seven days:	Never or rarely Sometimes

		- You were bothered by things that usually do not bother you - You could not shake off the blues, even with help from your family and your friends. - You felt that you were just as good as other people - You had trouble keeping your mind on what you were doing - You were depressed - You were too tired to do things - You enjoyed like - You were sad - You felt that people disliked you	A lot of the time Most of the time or all of the time
	Having unwanted baby	- Please think back to the time just before you (your partner) became pregnant. Did you want to have a child then?	Yes/ No
	Employment status	- In <year>, did you work for pay? - Did you work the entire year?	Yes/ No
	Physically abused as a child	- How often had your parents or other adults care-givers slapped, hit, or kicked you?	Never One time Two times 3 to 5 times 6 to 10 times > 10 times
	Neglected as a child	- By the time you started 6th grade, how often had your parents or other adult care-givers left you home alone when an adult should have been with you? - How often had your parents or other adult care-givers not taken care of your basic needs, such as keeping your clean or providing food or clothing?	Never One time Two times 3 to 5 times 6 to 10 times > 10 times
Family			
	Number of children	- Household roster	Number of children
	Single parent	- Household roster	
	Violent relationship with partner	- How often have you threatened <partner> with violence, pushed or shoved {him/her}, or thrown something at {him/her} that could hurt? - How often have you slapped, hit, or kicked <partner>? - How often have you insisted on or made <partner> have sexual relations with	Never Once Twice 3 to 5 times 6 to 10 times

		you when {he/she} didn't want to? - How often have you had an injury, such as a sprain, bruise, or cut because of a fight with <partner>?	11 to 20 times more than 20 times
	Loving relationship with partner	- How much do you love <partner>? - How much do you think <partner> loves you?	A lot Somewhat A little Not at all
	Financial supports	- Has {he/she} given you any money or paid for anything significant for you during the past 12 months? Don't include regular birthday or holiday gifts. - Please give an estimate of this financial help in the past 12 months.	< $200 $200 to $499 $500 to $999 ≥ $1000
	Relationship with parents	- You enjoy doing things with {him/her}. - Most of the time, {he/she} is warm and loving toward you.	5-point Likert, Strongly agree to Strongly disagree
		- How close do you feel to {him/her}?	5-point Likert, Extremely close to Not close at all
Neighbor			
Structural	*Ethnic heterogeneity*	- Dispersion in race composition	
	Residential mobility	- Proportion in same house as in 1985 - Proportion in same county as in 1985	
	SES	- Median household income - Proportion under $15,000 of income - Proportion under $25,000 of income - Proportion under $50,000 of income - Proportion under $75,000 of income - Median family income - Per capita income in 1989 - Proportion with income below poverty level - Proportion families with income below poverty level - Proportion families with child with income below poverty level - Proportion 25+ years without high school diploma - Proportion 25+ years with college or higher - Unemployment rate	

	Proportion single households	- Proportion single female households with children - Proportion single households with children
	Housing quality	- Proportion housing lacking plumbing - Proportion housing lacking kitchen
	Violent crime rate	- Violent crime rate per 100,000 - Juvenile violent crime arrests per 100,000
Perceptual	Network	You know most of the people in your neighborhood. In the past month, you have stopped on the street to talk with someone who lives in your neighborhood. People in this neighborhood look out for each other
	Happiness	On the whole, how happy are you with living in your neighborhood? If, for any reason, you had to move from here to some other neighborhood, how happy or unhappy would you be?
	Safety	Do you usually feel safe in your neighborhood?
	Resources	Do you use a physical fitness or recreation center in your neighborhood?
Geographical	Urbanity	Proportion urban
	Region	Census region

Note: a asked to children age of < 2, b asked to children age of > 2

Data Analysis

The previous chapter presented the conceptual framework of child maltreatment in the ecological system of this study. In this section, several considerations regarding data analysis are discussed. The section begins by introducing the statistical model that is appropriate to the multi-level, nested data structure of this study.

Statistical Model: Multilevel Model

In this study, the hypotheses are tested using multilevel model (MLM) to address the multilevel structure of this study design. A multilevel modeling approach, a procedure that is common in sociology, public health, and education, is considered appropriate because there are two levels of unit of analysis; individual/family and neighborhood (Kreft & Leeuw, 1998; Raudenbush & Bryk, 2002; Snijders & Bosker, 1999). The multilevel modeling approach was developed to analyze hierarchically structured data that consists of lower-level observations (e.g., student) nested within higher level(s) (e.g., class, school, school district etc.). This approach avoids underestimations of standard errors and specification errors, which are common mistakes when analyzing hierarchically structured data sets (Hox, 2002).

Traditional vs. Multilevel Models

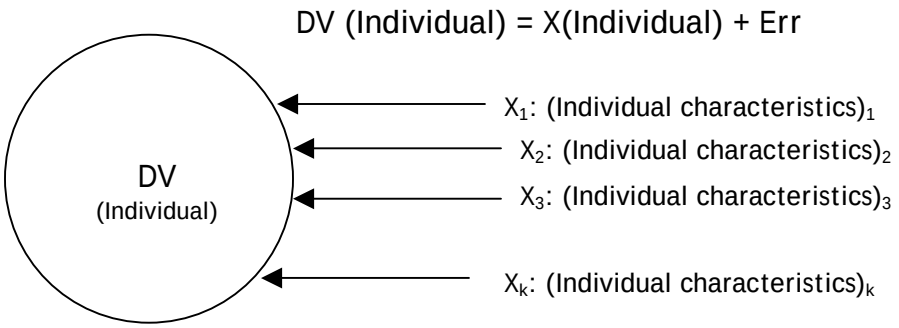
The traditional regression model cannot incorporate the nested structure of the ecological system into its analytical framework (Goldstein, 2003). Non-multilevel traditional regression model can utilize only one of either individual or neighborhood

level factors, but cannot simultaneously integrate both factors into an analytical framework. As illustrated in Figure 5, if the unit of analysis is individual, individual level explanatory variables (X_1, X_2, … X_k) are incorporated into the analytical model to explain the variance in the outcome variable (DV) that is also measured at the individual level. On the other hand, when the unit of analysis is neighborhood, only neighborhood level explanatory variables (Z_1, Z_2, … Z_m) can be included into the neighborhood model with the outcome variable (DV) measured at the neighborhood level (e.g., child abuse rate in each neighborhood).

Even in the traditional model, however, explanatory variables measured at the neighborhood level (e.g., poverty rate, crime rate) can be incorporated into the analytical model with the outcome variable measured in individual level. In this case, neighborhood variables that are measured in the neighborhood level are assigned to as many individuals as number of cases that reside in the same neighborhood. However, the design effect of nested sampling structure cannot be incorporated into the traditional non-multilevel model, which results in a positively biased estimate of parameters (Snijders & Bosker, 1999). The design effect of the nested sampling structure emerges from the fact that individuals residing in the same neighborhood are not completely independent from each other.

One of the basic assumptions of traditional statistical tests is that the observations are independent from each other. In a hierarchically nested design, the independence of observations does not hold true. Given the violation of this basic assumption, it is undesirable, although possible, to incorporate both individual and neighborhood factors

Traditional regression model with individual as a unit of analysis



Traditional regression model with neighborhood as a unit of analysis

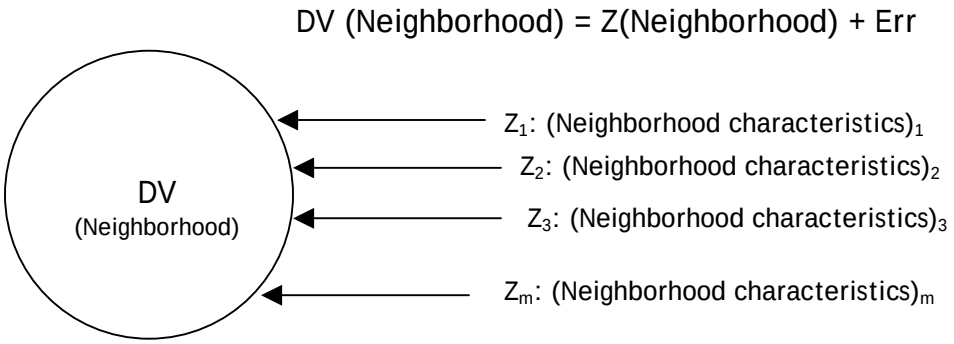
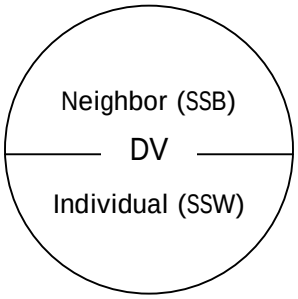


Figure 5 Non-multilevel traditional regression model

simultaneously in the traditional analytical model of child maltreatment even after the ecological theory was introduced to this field.

Briefly explaining the impact of design effect to statistical estimation, standard errors in the hierarchically structured sample are underestimated because of erroneous assumption that the cases from the same higher-level are completely independent from each other. For example, students in the same class tend to be more similar to each other in their academic achievement than students from different classes. As a result, the correlations of variables obtained between the cases from the same higher-level units are likely to be higher than the same correlations obtained between the cases from different higher-level units. This within higher-level unit, or class, correlation leads to estimates for standard errors that are too small, which may generate spuriously significant results, or inflated type-I errors in the statistical test of significance (Hox, 2002; Snijders & Bosker, 1999).

The multilevel analytical design is adequate when a researcher concerned with the relationships between variables that are measured at a number of different hierarchical levels (Hox, 2002). In the multilevel analysis framework, as illustrated in Figure 6, the outcome variable that is measured at the individual level is viewed in terms of two different components of variance (i.e., within-group (SSW) and between-group (SSB) variances). Furthermore, variables belonging to lower (i.e., individual) and higher (i.e., neighborhood) levels are incorporated into the model to explain the within-group (i.e., individuals within a neighborhood) and between-group (i.e., between neighborhoods) variance components, respectively, of the outcome variable measured in



Neighbor (SSB): Variance associated with neighborhood level differences

Individual (SSW): Variance associated with individual level differences

Figure 6 Multilevel analytical framework of a dependent variable

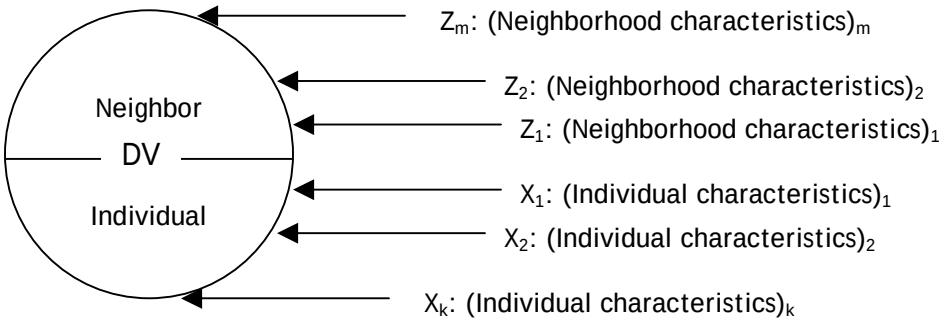


Figure 7 Multilevel analytical framework in a neighborhood study

individual level. Figure 7 illustrates the multilevel analytical model's incorporation of individual and neighborhood level variables to explain individual level (i.e., within-group) and neighborhood level (i.e., between-group) components of the dependent variable.

The MLM, also known as the Hierarchical Linear Model (HLM) and a type of random effect model, is appropriate for this study for several reasons. First, MLM is widely considered most appropriate to use when there is more than one unit of analysis that is nested into another (Raudenbush & Bryk, 2002). In this study, as an example, individuals and families are nested in the neighborhoods. Second, the main research goal of this study is to examine the cross-level interaction, or moderation, effects and one of the general uses of a MLM is to model cross-level effects. Modeling cross-level interaction effects is to formulate and test whether and how variables measured at one level affects the relationships occurring at another (Raudenbush & Bryk, 2002). The analytical description of the cross-level effects is presented in the *Random Effect Multilevel Model* section of this chapter. Research questions 2-1 and 2-2 are examples of modeling cross-level effects.

Random Intercept Multilevel Model

As briefly mentioned in the description of Figure 5, traditional analytical models can incorporate only one unit of analysis, either individual or neighborhood in its design. Although there is a way to incorporate individual and neighborhood level variables into one analytical model with neighborhood variables by repeating, or disaggregating,

multiple individual cases in the same neighborhood unit, this disaggregation in the traditional analytical model results in "the miraculous multiplication of the number of units" (Snijders & Bosker, 1999, p15) and, consequently, inflates type I errors for the study of between-group differences.

Using regression equations, the traditional model can be represented as

$$Y_i = \beta_0 + r_i \qquad [1]$$

$$Y_i = \beta_0 + \sum_k \beta_k X_{ki} + r_i \qquad [2]$$

where i represents each unit of analysis and r_i represents the unique effect of i-th case, or residual. In the Equation [1], a null model without any explanatory variable,

$$\text{Var}(Y_i) = \text{Var}(r_i) = \sigma_0^2 \qquad [3]$$

is the only variance component that is explained by incorporating a number of explanatory variables, X_k, in Equation [2].

However, the simplest possible MLM can be presented in a mathematical notation as follows:

$$Y_{ij} = \beta_{0j} + r_{ij} \qquad [4]$$

where *i* represents each individual respondent in the sample and *j* represents a higher level unit of analysis, such as the neighborhood unit used in this study. The β_{0j} is the unique intercept of the *j*th neighborhood unit. The residual for the individual level model or unique effect of individual *i* in neighborhood unit *j* is represented by r_{ij}, which for simplicity, is assumed to be distributed with homogeneous variance across higher level units of analysis, that is, $r_{ij} \sim N(0, \sigma^2)$. In MLM, the intercept β_{0j} is again represented in a regression equation in the neighborhood level as follows:

$$\beta_{0j} = \gamma_{00} + u_{0j} \qquad [5]$$

where γ_{00} is the average intercept across the neighborhood units and u_{0j} is the unique, or random, effect of the *j*-th neighborhood to the intercept. Substituting Equation [5] for Equation [4] yields:

$$Y_{ij} = \gamma_{00} + u_{0j} + r_{ij} \qquad [6]$$

which is equivalent to the one-way random effect ANOVA model with the grand mean γ_{00}; with a higher level, or neighborhood, unique effect, u_{0j}; and with a lower level, or individual, unique effect, r_{ij}. In Equation [6], a multilevel null model that is equivalent to Equation [1] in the traditional regression model, the variance of the outcome variable Y_{ij} is:

$$\text{Var}(Y_{ij}) = \text{Var}(u_{0j} + r_{ij}) = \tau_{00} + \sigma^2 \quad [7]$$

Equation [7] provides information about variability of the outcome variable at each of the two levels, individual and neighborhood. The τ_{00} represents the between-group variability (SSB) which is associated with differences between neighborhood level characteristics. The σ^2 represents the within-group variability (SSW) which is associated with differences between individual characteristics within each neighborhood unit. Different from the traditional regression model of Equation [1] and [3], there are two distinct components of variability, τ_{00} (SSB) and σ^2 (SSW), in the multilevel model of Equation [6] and [7]. This difference is illustrated in Figures 5 and 6.

These variability components are further explained in more elaborate multilevel models by incorporating explanatory variables from neighborhood and individual levels, respectively. Assuming, for simplicity, that there is only one individual level explanatory variable, X_{ij}, which is incorporated to explain the outcome variable, Y_{ij}, Equation [4] becomes

$$Y_{ij} = \beta_{0j} + \beta_{1j} X_{ij} + r_{ij} \quad [8]$$

and when combined with Equation [5] of random intercept

$$Y_{ij} = \gamma_{00} + \beta_{1j} X_{ij} + u_{0j} + r_{ij} \quad [8\text{-}1]$$

In Equation [8] and [8-1], β_{0j} is the unique intercept, or value of the outcome variable Y_{ij} when X_{ij} equals zero in the neighborhood unit j adjusted for differences among these units in X_{ij}, and $\text{Var}(r_{ij}) = \sigma^2$ is now a residual variance after the individual level explanatory variable X_{ij} is incorporated. The multilevel model of Equation [8] that incorporates only individual level explanatory variables (X_{ij}) is illustrated in Figure 8.

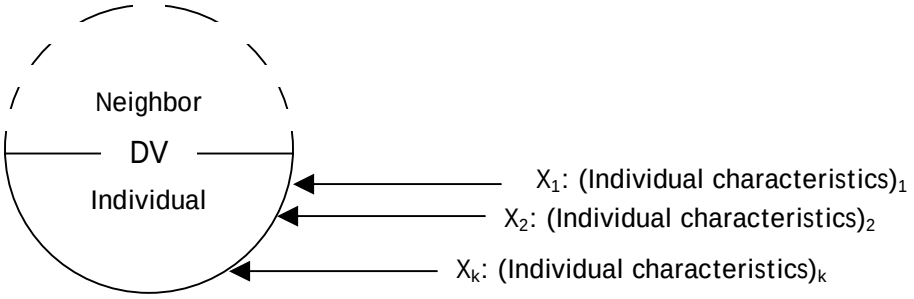


Figure 8 Multilevel model with individual level explanatory variables

It is possible to incorporate only neighborhood level variables to explain neighborhood level variability component of Equation [6] and [7], τ_{00}. Assuming again that only one neighborhood level explanatory variable, Z_j, for simplicity, Equation [5] becomes

$$\beta_{0j} = \gamma_{00} + \gamma_{01} Z_j + u_{0j} \qquad [9]$$

Combining Equation [9] with [4] produces

$$Y_{ij} = \gamma_{00} + \gamma_{01} Z_j + u_{0j} + r_{ij} \qquad [10]$$

where γ_{00} is the grand intercept and γ_{01} is the regression coefficient of the neighborhood level variable, Z_j, to the individual level outcome variable Y_{ij}. In Equation [10], the neighborhood level variability component, $\text{Var}(u_{0j}) = \tau_{00}$, is the neighborhood level residual variance remaining after the neighborhood level variable, Z_j, is taken into account. The multilevel model of Equation [10] is illustrated in Figure 9.

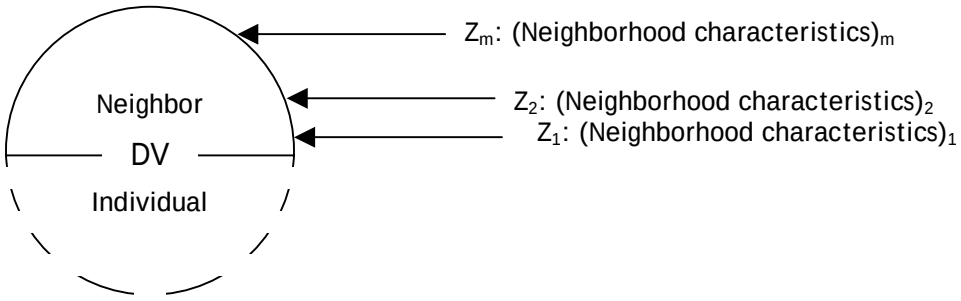


Figure 9 Multilevel model with neighborhood level explanatory variables

Models illustrated in Figures 8 and 9 are multilevel models that correspond to the traditional models illustrated in Figure 5. More practically, however, both individual and neighborhood level explanatory variables in Equation [8] and [10], X_{ij} and Z_j, are incorporated in the multilevel model to explain each of the individual and neighborhood level variability components, τ_{00} and σ^2, respectively. A more elaborate multilevel model

that incorporates both individual and neighborhood level explanatory variables is obtained by combining Equation [8] and [10], which is

$$Y_{ij} = \gamma_{00} + \gamma_{01} Z_j + \beta_{1j} X_{ij} + u_{0j} + r_{ij} \qquad [11]$$

The multilevel model of Equation [11] can be displayed by combining Figures 8 and 9 as illustrated in Figure 10.

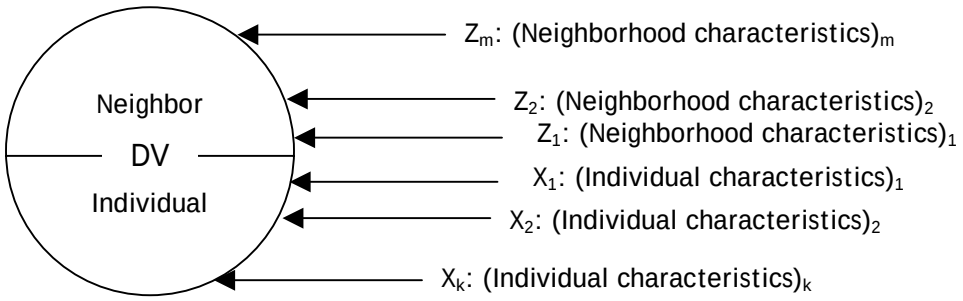


Figure 10 Multilevel model with both individual and neighborhood level explanatory variables incorporated

Quite often, the effect of X_{ij}, is constrained as the same fixed value for each neighborhood unit as shown in the following equation

$$\beta_{1j} = \gamma_{10} \qquad [12]$$

and the combined model becomes

$$Y_{ij} = \gamma_{00} + \gamma_{01} Z_j + \gamma_{10} X_{ij} + u_{0j} + r_{ij} \qquad [13]$$

Equation [12] specifies that there is no unique contribution of each neighborhood unit to the effect, or slope in the regression model, of the individual level and family level risk factors.

Random Effect Multilevel Model

All of the multilevel models discussed so far can be deemed random-intercept models. This is because only the individual level intercept coefficient, β_{0j}, is viewed as random as shown in Equation [5], while regression coefficient, β_{1j}, is constrained to having a common effect for all neighborhood units, or fixed-effects, as in Equation [11]. However, the assumption of fixed-effects is not necessarily true for some cases. Moreover, a major application of MLM is with models in which effects of individual level explanatory variables, or slopes, are regarded as varying randomly across the population of neighborhood units (Raudenbush & Bryk, 2002). In these random-effects models, Equation [12] and [13] become

$$\beta_{1j} = \gamma_{10} + u_{1j} \qquad [14]$$

and

$$Y_{ij} = \gamma_{00} + \gamma_{01} Z_j + \gamma_{10} X_{ij} + u_{1j} X_{ij} + u_{0j} + r_{ij} \quad [15]$$

in which there are three components of random errors: u_{0j}, the random effect of neighborhood unit j on the intercept; $u_{1j}X_{ij}$, where u_{1j} is the unique contribution of neighborhood unit j to the effect of an individual level explanatory variable, X_{ij}; and the individual level residual, r_{ij}. In Equation [15],

$$\text{Var}(u_{1j}) = \tau_{11} \quad [16]$$

denotes unconditional variance in the individual level slopes, or effects of the individual level explanatory variable. Figure 11 illustrates an example of random-effects multilevel model. Each line in Figure 11 represents a distinct regression line that corresponds to a neighborhood unit.

If the variance of the random-effects in Equation [16], τ_{11}, is indeed non-zero, the neighborhood level explanatory variable can be incorporated into the Equation [14] and results in

$$\beta_{1j} = \gamma_{10} + \gamma_{11} Z_j + u_{1j} \quad [17]$$

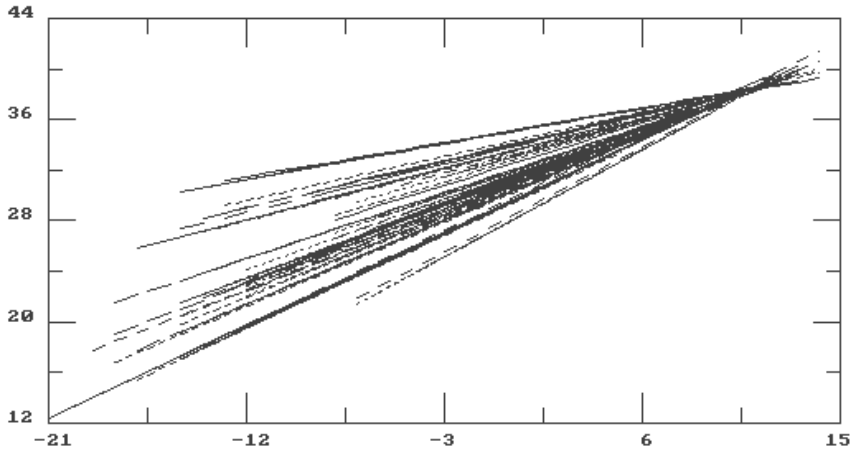


Figure 11 Illustration of random-effects, or slope, in a multilevel model

Equation [17] can again be combined with Equation [11] to produce the most comprehensive multilevel model with random-intercept and random-effects as following

$$\begin{aligned} Y_{ij} &= \gamma_{00} + \gamma_{01}Z_j + (\gamma_{10} + \gamma_{11}Z_j + u_{1j})X_{ij} + u_{0j} + r_{ij} \\ &= \gamma_{00} + \gamma_{01}Z_{1j} + \gamma_{10}X_{ij} + \gamma_{11}Z_jX_{ij} + u_{1j}X_{ij} + u_{0j} + r_{ij} \end{aligned} \qquad [18]$$

In Equation [18], a cross-product term between individual level and neighborhood level explanatory variables, $\gamma_{11}Z_jX_{ij}$, represents the cross-level interaction effect, or moderation effect, in MLM. Non-zero γ_{11} implies that the individual level slope, or effects of individual level explanatory variable, X_{ij}, is altered by neighborhood level explanatory variable, Z_j, of neighborhood unit j.

Figure 12 illustrates the random-intercept, random-effects multilevel model that is described using Equation [18].

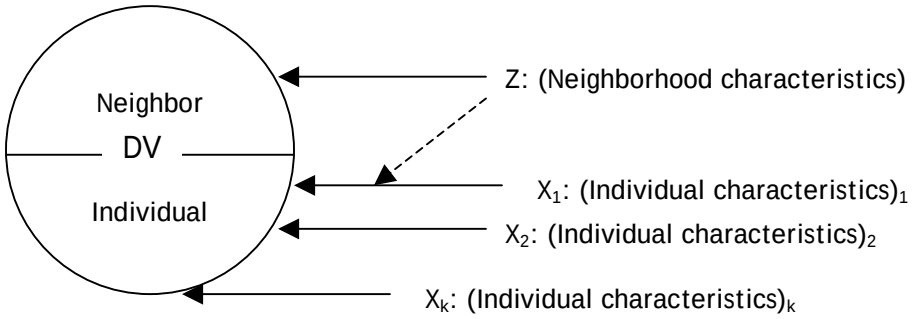


Figure 12 Random effect multilevel model

Multilevel Logistic Regression Model

As previously described, the dichotomized child maltreatment variables are employed as dependent variables for different types of child maltreatment. Consequently, logistic regression analysis models are utilized for this study. It is assumed that the distribution of each dependent variable follows the binary distribution and, as such, the logit link function is employed for the models utilized in this study. In other words,

$$Y_{ij} \mid \varphi_{ij} \sim B(m_{ij}, \varphi_{ij}) \qquad [19]$$

denotes that Y_{ij} has a binomial distribution with m_{ij} trials and probability of event occurrence (i.e., child maltreatment for this study) per trial as φ_{ij}. Using the level-1 independent variables, X_{kij}, the linear structural model can be written

$$\eta_{ij} = \beta_{0j} + \sum_{k} \beta_{kj} X_{kij} \qquad [20]$$

where the link function is

$$\eta_{ij} = \log\left(\frac{\varphi_{ij}}{1-\varphi_{ij}}\right). \qquad [21]$$

As described before, the intercept, β_{0j}, and the effect of each independent variable, β_{kj}, can be modeled further using level-2 independent variables as shown in the equations [9] and [17].

Statistical Test of Variance

There were two test results that offered a test of the significance for the random intercept variance of each model. The first test, called Wald test, was conducted using point estimate and asymptotic standard error of the standard deviation of the random intercept values estimated by the models. In the Wald test, the z-score that is defined by the following formula

Z = (point estimate) / (standard error of the estimate)

was obtained. The squared z-score was assumed to follow the Chi-square distribution and the corresponding probability value was calculated. If the test result showed that the standard deviation of the random intercept was significantly different from zero, the

variance of the random intercept could be obtained by squaring the point estimate of the standard deviation. However, since the standard errors used in the Wald test are asymptotic, which means that the value is calculated under the assumption of a sufficiently large sample size, a relatively large level-2 sample size is required for using the Wald test as a significance test of the variance of the random intercept in the multilevel model (Hox, 2002).

The other approach to testing the significance of the variance of random intercept is to utilize the likelihood function for the test. More specifically, this approach utilizes the difference of deviances between two models tested. The deviance, defined as

$$D = -2\log(\text{likelihood}) = -2LL,$$

represents how well the model fits the data. The difference of the deviances between two nested models follows a chi-square distribution with degrees of freedom equal to the difference in the number of parameters estimated in each model. The chi-square test using the difference in deviances of two models is called the likelihood ratio test. The result of this test should be interpreted with caution, especially when it is used to test a variance component. Since the variances are, by definition, greater than zero, the one-sided probability value should be used instead of the conventional two-sided value when testing the null hypothesis that a variance of the random intercept is zero (Snijders & Bosker, 1999). In other words, the p-value from the Chi-square difference test of the deviance must be divided by two if a variance component is tested. Although the Wald

test and the likelihood ratio test should be equivalent asymptotically, the two tests do not necessarily produce the same result.

CHAPTER IV

DATA ANALYSIS & RESULTS

The results of this study are presented in the two sections of this chapter. The first section describes the characteristics of the study sample. Included in the first section are data on the demographic and other key characteristics of the overall sample and grouped by maltreatment type. The second section addresses the research questions formulated for this study. A series of multilevel logistic regression analyses are conducted and results of the analyses are also presented in the second section of this chapter. The second section is further divided by the study's four specific research questions.

The first research question asks whether the likelihood of child maltreatment varies across neighborhood units after controlling for the individual/family level variables' effects on child maltreatment and, if it does, what neighborhood level variables explain the neighborhood level variance in child maltreatment prevalence rates. This question is addressed by a series of random intercept multilevel models that introduce the neighborhood level variance component of the dependent variable along with the individual level variance of the traditional regression model.

The second research question examines whether and how the neighborhood level variables alter the effects of individual/family level variables on child maltreatment. A series of random effects, or slopes, multilevel models of child maltreatment, which assume the individual/family level variables' effects on child maltreatment are not same for all neighborhood units, are utilized to answer the second research question.

The third research question asks whether different model should be developed for child neglect and physical abuse. This question is answered by comparing two multilevel logistic regression models with the same independent variables, but the different dependent variables of neglect and physical abuse.

The last research question inquires about the estimated applicability of the four existing neighborhood process models to the child maltreatment context. This question is addressed by comparing multilevel logistic regression models with and without the key variables from each of neighborhood process model.

Each section of this chapter begins with statements about what and how to answer each research question. This brief description is followed by the answer to each research question through presenting and explaining the relevant statistics, if any, utilized to answer the question. The answer to each question is further elaborated by linking the findings to the conceptual and analytical framework that was described in Chapter II and III. Brief summaries of each section and this whole chapter are provided at the end of each section and the conclusion of the chapter as well.

Preliminary Analysis

To explore the overall distribution of key variables in this study, both univariate analysis for each of the dependent and independent variables and bivariate analysis using child maltreatment variables as dependent variables were performed. This process allowed us not only to provide descriptive statistics of the study sample, but also to contrast the characteristics of abusers with those of non-abusers. In the bivariate analyses,

the cross tabulation and Chi-square test of independence results for nominal level independent variables are provided. Also, the results of the independent group t-test for ordinal and interval level variables are implemented and reported in Table 2.

Study sample description

A total of 15,197 early adults participated in Wave III of the Add Health study. Among these study participants, only those who had at least one child at the time of the interview were considered eligible for this dissertation study. This inclusion criteria was set because the child maltreatment questions were asked only at the Wave III of the Add Health study. Of those participants, less than 20 percent (N=2,960) had at least one baby at the time of the interview for Wave III.

Descriptive statistics for the study sample are presented in the Table 2. Of the 2,960 early adults included in the analyses for this study, 69% were female. Less than half of the study sample were White, 27% Black, 19% Hispanic, 1% American Indian, 4% Asian or Pacific Islander, and one case (0.03%) of other ethnic categories. The ages of the participants ranged from 18 to 27 with a mean age of 23 years. The respondents became parents between the ages of 11 to 27, with an average age of 20 years. About half of these parents have been employed constantly, 40% cyclically employed, and 12% never employed after being parents. The average school year completed among the parents was slightly over 12 years.

About 66% of the parents had at least one child from an unwanted pregnancy. The average number of babies per parent was 1.4 and about two fifths of the study

Table 2 Sample description by type of maltreatment

		Non-Abuser	Any Abuse		Physical Abuse		Neglect		Total
Child									
	Oldest baby age (Mean)	2.45	3.08	***	3.59	***	2.85	**	2.61
		(2.00)	(2.16)		(1.87)		(2.27)		(2.07)
	Low birth weight (<2.5kg) (%)	9.82	12.04	*	11.16		13.96	**	10.41
	Premature born (<40wks) (%)	25.64	27.07		25.21		27.73		26.04
Parent									
	Age (Mean)	22.48	22.55		22.64		22.47		22.49
		(1.65)	(1.60)		(1.54)		(1.63)		(1.64)
	Ethnicity (%)			*		**		***	
	White	49.84	43.30		41.10		39.82		48.11
	Black	26.07	31.22		28.39		35.07		27.43
	Hispanic	19.02	19.00		24.58		17.87		19.09
	American Indian	1.20	1.47		1.27		1.81		1.25
	Asian/Pacific Islander	3.87	4.86		4.24		5.43		4.09
	Others		0.15		0.42				0.03
	Gender (%)					**			
	Female	69.28	68.48		77.97		61.09		68.51
	Male	30.72	31.52		22.03		38.91		31.49
	Education yr. (Mean)	12.26	12.10	*	12.24		12.10	†	12.21
		(1.68)	(1.66)		(1.57)		(1.69)		(1.67)
	Age being parents (Mean)	20.03	19.46	***	19.05	***	19.60	**	19.87
		(2.15)	(2.29)		(1.99)		(2.45)		(2.20)
	Employment (%)			†		*			
	Consistently employed	48.46	51.99		57.63		49.10		49.36
	Cyclically employed	40.40	35.35		30.51		37.33		39.09
	Never employed	11.15	12.67		11.86		13.57		11.55
	Abuse history (%)								
	Abused, any type	46.27	69.52	***	79.31	***	66.58	***	51.90
	Physically abused	23.77	41.76	***	62.67	***	33.01	*	28.10
	Neglected	35.52	57.35	***	59.38	***	58.52	***	40.75
	Having unwanted baby (%)	64.28	72.04	***	77.35	***	68.48		66.17
Family									
	Number of children (Mean)	1.39	1.45	†	1.36		1.51	***	1.41
		(0.67)	(0.75)		(0.67)		(0.82)		(0.69)
	Single parent (%)	38.37	45.66	**	49.58	**	44.34	†	40.34
Neighborhood									
	Region (%)			*		***			
	West	21.80	24.25		27.59		23.67		22.87
	Midwest	26.87	24.25		25.43		22.04		25.89
	South	43.41	40.21		30.60		45.94		42.59
	Northeast	7.91	11.30		16.38		8.35		8.64
	Urban (%)	55.13	57.06		61.21		55.49		55.32
	N	2,171	679		236		442		2,960
	%	76.18	23.82		8.19		15.33		

Note: †<.10, * p<.05, **<.01, ***<.001, Numbers in parentheses: Standard deviation

respondents were raising their children without other parental figures. Over 10% of the parents had at least one baby who was born low birth weight (<2,500g) and 26% had babies born prematurely (<40 weeks of pregnancy).

More than a half of the parents disclosed that they experienced some form of maltreatment as children. More specifically, 28% reported that they had experienced physical abuse and 41% some type of neglect in their childhood. With regard to parents' maltreatment of their offspring, the overall prevalence rate of child maltreatment was approximately 24%. Over 15% of parents reported that they left their children without proper supervision or did not take care of their children's basic needs. Eight percent slapped, hit, or kicked their children at least once.

Multilevel Logistic Regression Analysis

A series of multilevel logistic regression analyses were utilized to test the hypotheses of this study. As proposed in Chapter III, the individual level independent variables were separated into two blocks of variables: child and parents factors. A set of family level variables was also incorporated into the models as a block. Neighborhood level variables were further divided into three domains: structural, perceptual, and geographical domains. These domains were also incorporated into the models as blocks. In essence, the variables in the same block were included into the model at the same time. This approach allowed an estimation of the contributions of the variables in each block to explain the occurrences of child maltreatment, in addition to the significance test of each variable in the model.

This section is further divided into four parts to reflect each of four research questions: random intercepts multilevel model to address Research Questions 1-1 and 1-2; random effects multilevel model to address Research Questions 2-1 and 2-2: comparison of multilevel models with same set of independent variables, but different dependent variables, child neglect and physical abuse for Research Question 3; and multiple sets of multilevel logistic regression models with different neighborhood level variables to evaluate the utility of different neighborhood process models to address Research Question 4. Table 3 in the next page summarizes the multilevel logistic regression models, specific statistics utilized to address each research questions, and an index of tables to present the information.

As mentioned before, each part of this section begins with the research questions and how it is answered. It is followed by findings specific to each research question and an explanation of the relevant statistics utilized to answer the question. Further discussion of the findings that links the results to the conceptual and analytical framework that was described in Chapters II and III. A brief summary of findings concludes each section.

The models in this study were estimated by the maximum likelihood estimation in Stata using *gllamm* (Generalized Linear Latent and Mixed Models) (Rabe-Hesketh, Pickles, & Taylor, 2000) and adaptive quadrature (Rabe-Hesketh, Skrondal, & Pickles, 2002).

Table 3 Summary of statistic, model, and table for each research question

Question	Statistics	Table	Model
Question 1-1: *Does the likelihood of child maltreatment vary significantly across different neighborhoods after taking the effect of individual and family level risk factors into account?*	Likelihood ratio test and Wald test of significance for τ_{00}	Table 4 and 5	Model 6
Question 1-2: *If yes, which neighborhood level variables are significantly associated with the neighborhood level variation of child maltreatment prevalence rate?*	Likelihood ratio test of τ_{00} and Wald test of regression coefficient	Table 6 and 7	Model 7-10
Question 2-1: *Do the effects of individual/family level factors to the parents' risk of maltreating their children vary significantly across neighborhood units?*	Likelihood ratio test and Wald test of significance for τ_{00}	Table 8 and 9	Model 6
Question 2-2: *If yes, which neighborhood level conditions are significantly associated with the variation of the effects of the individual/family level factors?*	Likelihood ratio test of τ_{00} and Wald test of regression coefficient	Table 10	
Question 3: *Is the model for parents' risk of neglecting their children different from that of physically abusing their child? If it is, how different?*	Comparison of regression coefficient for each variable	Table 11 through 17	Model 10
Question 4: *Among the existing process models of neighborhood factors which is most effective in explaining the neighborhood effects on child maltreatment?*	Likelihood ratio test of Model 6 vs each neighborhood model	Table 18	

Research Question 1: Random Intercepts Multilevel Model

Before directly analyzing data for this study's research questions, the likelihood ratio test between a null random intercept model (i.e., no independent variable) and a simple, or traditional, logistic regression model without level-2 (i.e., neighborhood level) random intercept was conducted. Although not directly related to the research questions of this study, it is important because it provided a key information to determine whether the research questions are best addressed using the multilevel model instead of the traditional regression model. The test results are presented in Table 4.

Table 4 Summary statistics of null model

Statistics	Null Model		
Wald test	τ_{00}	SE(τ_{00})	p
	0.412	0.199	.038
Likelihood ratio test	-2ΔLL	df	p
	1.53	1	.108

Statistical evidence revealed mixed results regarding this question. The chi-square test result showed that adding the random intercept term into the simple logistic regression model did not improve the overall model fit significantly ($\chi^2(1) = 1.53$, p (1-sided) = .108). This test result suggests that dividing the variance of dependent variable into two components, individual level and neighborhood level, does not add any explanatory power to the traditional non-multilevel logistic regression model in this stage.

However, as pointed out in the previous discussion, the Wald test result (SD = 0.412, S.E. (SD) = .199, p = .038) led to a different conclusion regarding the significance of the variance (standard deviation) of the random intercept in the null model. Unlike the result of the likelihood ratio test, the Wald test result showed that the standard deviation of the random intercept is significant in the population when the random intercept is associated into the null model.

It should be noted that many multilevel studies suggest that the likelihood ratio test result should be retained if there is a discrepancy between the result of a likelihood ratio test and that of the Wald test (Hox, 2002; Rabe-Hesketh, Pickles, & Skrondal, 2001; Snijders & Bosker, 1999) although the Wald test is more convenient and, thus, it is used the most in practice.

In summary, one of two comparable statistical test results on the neighborhood level variance in the null model of child maltreatment set the ground for utilizing multilevel design in this study. However, it should be noted that the result are not completely consistent with the alternative test result and, thus, caution must be taken in further analysis of this study.

Research Question 1-1: *Does the likelihood of child maltreatment vary significantly across different neighborhoods after taking the effect of individual and family level risk factors into account?*

The first research question in this study is answered by testing the significance of the variance of the random intercept in Model 6 (i.e., Child + Parent + Family) using likelihood ratio test between logistic regression models with and without random

variance of child maltreatment prevalence rate across neighborhood units. Table 5 presents a summary of statistical test results used to answer Research Question 1-1.

Table 5 Summary of statistics used for Research Question 1-1

Statistics	Model 6		
Wald test	τ_{00}	SE(τ_{00})	p
	0.473	0.210	.024
Likelihood ratio test	-2ΔLL	df	p
	1.77	1	.092

The likelihood ratio test result suggests that the standard deviation of the random intercept was marginally significant ($\chi^2(1) = 1.77$, p (1-sided) = .092) while the Wald test result shows that it is more definitely significant (SD = 0.473, S.E. (SD) = 0.210, p = .024)[11]. Although marginally significant in the likelihood ratio test, the variance of the random intercept was assumed and the further models incorporating the neighborhood level factors were designed based on this assumption.

As displayed in Figure 8 of Chapter III, Model 6 (i.e., Child + Parent + Family), the final model in the individual and family level, incorporates the individual/family level variables to explain the within-group errors of the dependent variable (i.e., errors associated with differences between individuals within the same neighborhood unit). Research Question 1-1 attempts to test whether the other component of errors in the

[11] As mentioned previously, one-sided test probability value was calculated and tested using 5% of Type-I error rate.

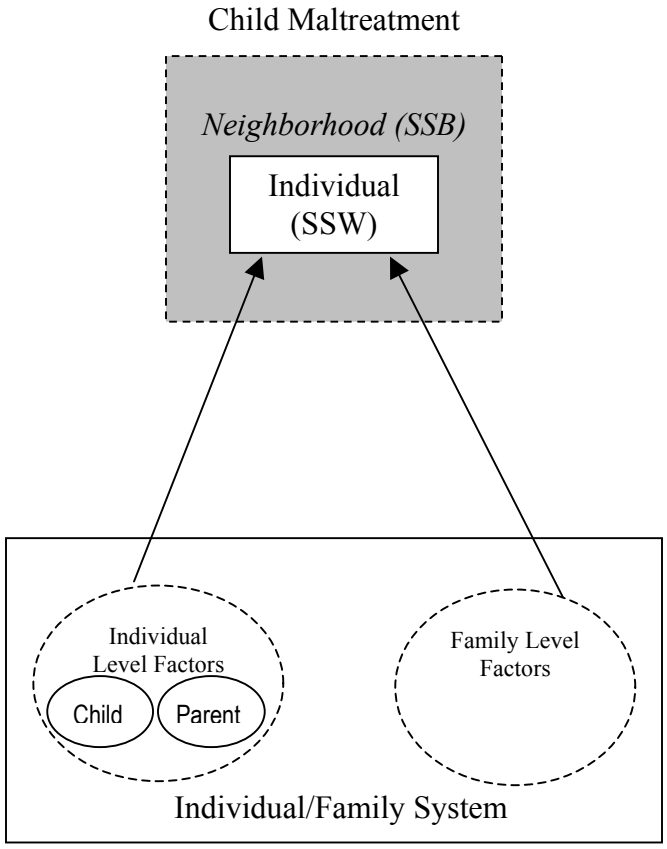


Figure 13 Illustration of Model 6 and test of Hypothesis 1-1

dependent variable that are associated with between-neighborhood differences are statistically significant or not, after the effects of individual and family level explanatory variables on child maltreatment are taken into account.

The neighborhood level variance component of the dependent variable is illustrated by the shaded area in Figure 13. The significant variance of the random intercept, Var (β_{0j}) = Var (u_{0j}) = τ_{00}, in the multilevel logistic regression model of

Equation [8] and [8-1][12] that incorporates the individual/family factors, indicates that the prevalence rate of child maltreatment varies significantly across the neighborhood units. A significant test result of this research question is illustrated by the shaded part (i.e., Neighborhood (SSB)) of child maltreatment in Figure 13.

In summary, the likelihood ratio test results of Model 6, the multilevel logistic regression of child maltreatment with the individual and family level risk factors, show that the prevalence of child maltreatment, after controlling for the effects of individual and family level risk factors, varies significantly, although marginally, across the neighborhood units when the census block groups were considered as a suitable neighborhood unit. This result warrants building further neighborhood models to explain which neighborhood level characteristics account for the variance of the random intercepts across the neighborhood units.

Research Question 1-2: *If the prevalence rates of child maltreatment vary across the neighborhood units, which neighborhood level variables are significantly associated with the neighborhood level variation of the child maltreatment prevalence rate?*

Research Question 1-2 is addressed by two kinds of statistics: likelihood ratio test between Model 6 (i.e., Child + Parent + Family: No neighborhood) and a series of models that includes each of three neighborhood domains and the Wald test of significance for regression coefficients of neighborhood level variables. The likelihood

[12] Equation [8] and [8-1] are as following:

$$Y_{ij} = \beta_{0j} + \beta_{1j} X_{ij} + r_{ij} \quad [8]$$

$$Y_{ij} = \gamma_{00} + \beta_{1j} X_{ij} + u_{0j} + r_{ij} \quad [8\text{-}1]$$

ratio test is utilized to examine whether inclusion of each neighborhood domain as a group of variables improves the overall model fit to the data. On the other hand, the Wald test is conducted to check whether each neighborhood level variable is significantly associated with the variance component of the dependent variable that is related to differences of neighborhood level characteristics (i.e., dashed semicircle and shaded area in Figure 8 and 13, respectively).

A summary of the statistical test results to answer Research Question 1-2 is again displayed in Table 6. Overall, of the three neighborhood domains, only the structural domain, marginally improves the overall model fit to the data when added to Model 6, individual and family level model of random intercept logistic regression model ($\chi^2(6) = 11.61$, p (2-sided) = .071).

Table 6 Summary of models and statistics for Research Question 1-2

Model	Neighborhood domain	-2ΔLL	df	p	Significant variables[a]	Odd ratio	p
Model 7	Structural Domain	11.61	6	.071	Violent crime rate	1.08	<.001
Model 8	Perceptual Domain	0.99	4	.900	None		
Model 9	Geographical Domain	5.10	4	.277	Region: Northeast[b]	1.63	.076
Model 10	All Three Domains	21.01	14	.102	Violent crime rate	1.08	<.001

Note: [a] Variables with p-value no greater than .10 are shown
[b] Region variable is dummy coded with East as a reference

Variables measuring the structural neighborhood domain were added to Model 6 (i.e., Child + Parent + Family) and estimated in Model 7 (i.e., Model 6 + Structural domain). The likelihood ratio test result shows that the inclusion of the structural domain

variables into the Model 6 marginally improves the model fit to the data ($\chi^2(6) = 11.61$, p (2-sided) = .071). Among the six neighborhood level variables measuring the structural domain of this study, only one variable, the violent crime rate in the neighborhood, yielded significance (B = 0.001, S.E. (B) < 0.001, p = .002). Although the absolute value of the coefficient appears to be minimal, the positive sign of the logistic regression coefficient implies that the prevalence rate of child maltreatment is higher in the neighborhoods showing higher violent crime rates, after controlling for the effects of individual and family level risk factors. More specifically, assuming all other conditions are equal, the prevalence of child maltreatment in a county where there is one more violent crime per 1,000 people, is about 8% higher than other neighborhood units.

Model 8 (i.e., Model 6 + Perceptual domain) and Model 9 (i.e., Model 6 + Geographical domain) added the variables of the perceptual and geographical domains, respectively, to the individual and family level Model 6. The likelihood ratio test results for Model 8 ($\chi^2(4) = 0.99$, p (2-sided) = .900) and Model 9 ($\chi^2(4) = 5.10$, p (2-sided) = .277) with Model 6 (i.e., Child + Parent + Family) of individual/family level model as the reference showed that neither of the models significantly improved the model fit to the data. In other words, considering the parsimony of the model, inclusion of the variables in the perceptual and geographical domains is not recommended. The likelihood ratio test of Model 10 (i.e., Model 6 + Three neighborhood domains), the full random intercept MLM of overall child maltreatment, shows that adding the neighborhood level variables to the individual and family level model does not improve the overall model fit to the data ($\chi^2(14) = 21.01$, p (2-sided) = .102).

While Table 6 provides the essential statistics for answering Research Question 1-2, more detailed statistical results are presented in Table 7. Given the answers to Research Question 1-1, which that is related to whether or not the neighborhood domains improve the overall model fit, it is beneficial to know how effective those domains are in explaining the neighborhood level variance of child maltreatment. Regarding this issue, another supplementary, but meaningful, statistic is provided in Table 7. This test was conducted in order to examine whether there is any remaining variance of random intercepts, or neighborhood level variance, after incorporating neighborhood level variables.

As mentioned before, the variance of the prevalence rates of child maltreatment, after controlling for the individual and family level effects in Model 6 (i.e., Child + Parent + Family), is marginally significant ($\chi^2(1) = 1.77$, p (1-sided) = .092). When each domain of the neighborhood factors was associated with the individual and family level model in Model 7 through Model 9, the random variance of the prevalence rates of child maltreatment turned insignificant after the structural domain factors were incorporated into the model (Model 7: $\chi^2(1) = 1.33$, p (1-sided) = .124).

However, the same random variances remained significant when either perceptual domain (Model 8: $\chi^2(1) = 1.72$, p (1-sided) = .095) or geographical domain (Model 9: $\chi^2(1) = 2.00$, p (1-sided) = .079) were included into the model. In Model 10 (i.e., Model 6 + Three neighborhood domains), the most comprehensive random intercept MLM of child maltreatment due to its inclusion of all individual/family and neighborhood level variables, the likelihood ratio test of random variance shows that

Table 7 Random intercept logistic regression models

	Any maltreatment	Model 6	Model 7	Model 8	Model 9	Model 10
		B	B	B	B	B
Child	Low birth weight	0.425 †	0.392 †	0.428 †	0.411 †	0.383 †
	Irritability	0.096	0.095	0.096	0.095	0.093
	Health	-0.030	-0.047	-0.027	-0.028	-0.040
	Developmental difficulties	0.429 **	0.444 **	0.427 **	0.433 **	0.441 **
Parent	Non White	0.181	0.002	0.154	0.210	0.007
	Education	0.031	0.036	0.033	0.034	0.035
	Gender	-0.229	-0.239	-0.231	-0.233	-0.229
	Social support	-0.040	-0.047	-0.035	-0.044	-0.043
	Age being parent	-0.099 **	-0.104 **	-0.101 **	-0.100 **	-0.105 **
	Alcohol abuse	0.000	0.019	0.000	0.005	0.021
	Drug abuse	0.162 *	0.167 *	0.163 *	0.161 *	0.168 *
	Self esteem	-0.051	-0.025	-0.046	-0.048	-0.027
	Depression	0.101	0.087	0.096	0.100	0.088
	Having unwanted baby	-0.018	0.005	-0.014	-0.011	0.006
	Cyclically employed	-0.278 †	-0.291 †	-0.284 †	-0.285 †	-0.296 †
	Never employed	0.122	0.124	0.123	0.123	0.128
	Neglected as a child	0.642 ***	0.672 ***	0.639 ***	0.648 ***	0.671 ***
	Physically abused as child	0.490 **	0.487 **	0.486 **	0.500 **	0.483 **
Family	Number of children	-0.072	-0.075	-0.075	-0.074	-0.083
	Single parent	0.299 †	0.281 †	0.292 †	0.274 †	0.270 †
	Negative relationship w/ partner	0.082	0.085	0.082	0.078	0.085
	Positive relationship w/ partner	0.024	0.021	0.025	0.025	0.017
	Financial supports	-0.002	0.000	-0.002	0.000	0.001
	Relationship w/ parents	-0.025	-0.033	-0.027	-0.029	-0.035
Structural	Ethnic heterogeneity		-0.238			-0.287
	Residential mobility		-0.041			-0.069
	SES		0.109			0.187
	Proportion single household		-0.063			-0.097
	Housing quality		0.079			0.074
	Violent crime rate		0.001 **			0.001 **
Perceptual	Network			-0.096		-0.030
	Happiness			-0.092		-0.046
	Safety			-0.307		-0.006
	Resource			0.112		0.202
Geographical	Urbanity				-0.107	-0.264
	Region: Midwest				-0.075	-0.145
	Region: South				-0.058	-0.342
	Region: Northeast				0.486 †	0.406
	T_{00} [c]	0.473 *	0.415 †	0.467 *	0.484 *	0.431 †
	LL=	-746.70	-740.76	-746.17	-743.93	-735.97
	[a] -2ΔLL=		11.61 †	0.99	5.10	21.01
	[b] -2ΔLL=	1.77 †	1.33	1.72 †	2.00 †	1.48

Note:DV: Overall child maltreatment, N (individual) = 1532, N(neighborhood) = 790

†<.10, * p<.05, **<.01, ***<.001, a: Model 6 as a reference, b: simple (non-multilevel) logistic regression model as a reference, c: Wald test result

there is no remaining random variance when all three domains of neighborhood factors are included in the child maltreatment model ($\chi^2(1) = 1.48$, p (1-sided) = .112).

In the analytical framework of MLM, models utilized to test Hypothesis 1-2 are explained using Figure 10 and Equation [11].[13] In sum, the random intercept MLM incorporates only one random part (i.e., random intercept) and a set of neighborhood level explanatory variables (Z_j's) to explain the variance of random intercept, after controlling for the effects of individual/family level explanatory variables (X_{ij}'s). In Equation [11], both individual level (X_{ij}) and neighborhood level (Z_j) variables are incorporated to explain within-group, Var(r_{ij})=σ^2, and between-group, Var(u_{0j})=τ_{00}, error components, respectively.

Figure 14 illustrates the conceptual framework that is utilized to test Hypothesis 1-2. Compared to Figure 13 of Hypothesis 1-1, which delineates the association between individual/family level variables and within-group variance, Var(r_{ij}) = σ^2, of child maltreatment, the neighborhood level explanatory variables are added and examines whether those neighborhood variables are significantly associated with the variance of random intercept (i.e., Var(u_{0j}) = τ_{00} of Equation [11]), or between-neighborhood component of errors, in the dependent variable of child maltreatment. The neighborhood level variables' effects on child maltreatment addressed in Research Question 1-2 is depicted by the shaded arrow from neighborhood level factors to the shaded area of child maltreatment (i.e., Neighborhood level variance (SSB) of child maltreatment) in Figure

[13] Equation [11] is shown here:

$$Y_{ij} = \gamma_{00} + \gamma_{01} Z_j + \beta_{1j} X_{ij} + u_{0j} + r_{ij} \qquad [11]$$

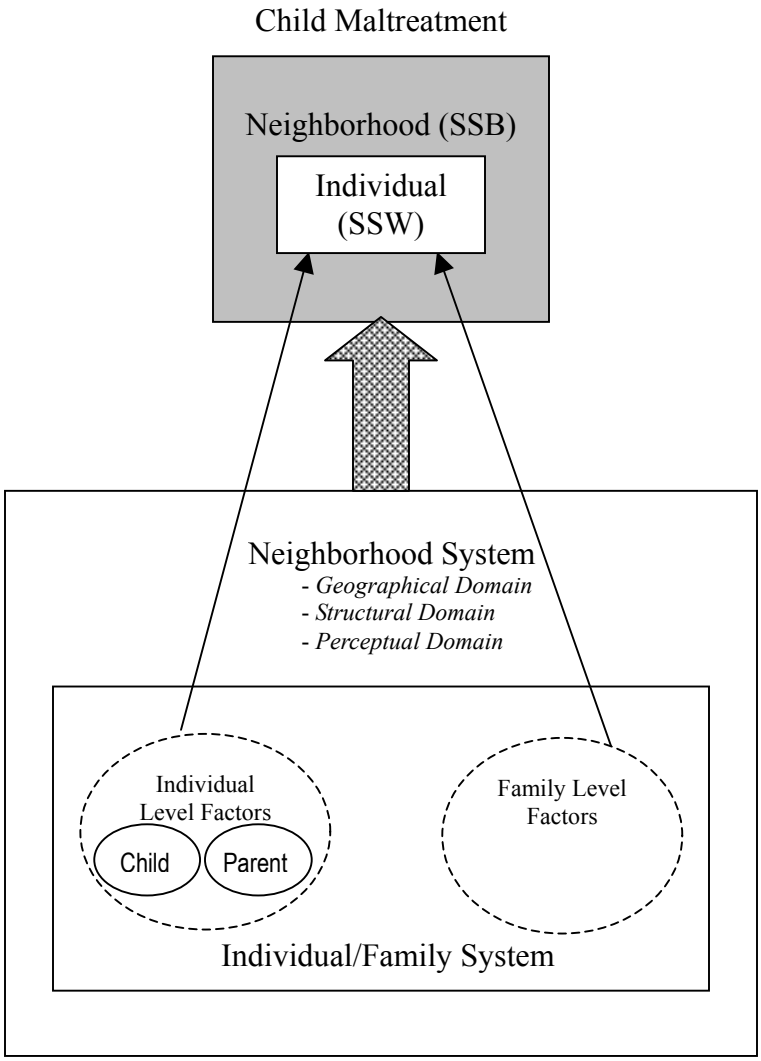


Figure 14 Random intercept MLM for child maltreatment

14.

Consistent with expectation, the inclusion of neighborhood level variables did not change the parameter estimations of the individual and family level variables estimated in Model 6, although slight differences were produced. It is because the neighborhood level variables in Model 7 and thereafter were associated to model the random intercept effect of the multilevel logistic regression model, which produced significance in Model 6. This relationship was specified using Z_j as the neighborhood level explanatory variables in Equation [11][14], which described the neighborhood level explanatory model for the random intercept.

In summary, out of three neighborhood domains of neighborhood level variables, only the structural domain, as a group of variables, is significantly associated with the between-neighborhood variance of child maltreatment prevalence rate across neighborhood units. Neither of the two other neighborhood domains introduced in this study, perceptual and geographical, are significantly associated with the neighborhood level variance of child maltreatment prevalence rates.

Research Question 2: Random Effects Multilevel Model

Research Question 2-1: *Do the effects of individual/family level factors to the parents' risk of maltreating their children vary significantly across neighborhood units?*

Research question 2-1 is addressed by the statistical test of the random effects, or

[14] Equation [11] is shown here:

$$Y_{ij} = \gamma_{00} + \gamma_{01} Z_j + \beta_{1j} X_{ij} + u_{0j} + r_{ij} \qquad [11]$$

slopes variance testing Var(u_{kj}) = 0 in Equation 14.[15] The likelihood ratio test between models with and without random effect for each of individual/family level variables was performed to answer this question. Table 7 summarizes the findings from the likelihood ratio tests but illustrates only the random effects for variances that are significant.

Table 8 Summary statistics used for Research Question 2-1

Dependent variable	Independent variable	τ_{11}	SE(τ_{11})	-2ΔLL[a]	p
Overall maltreatment	*Low birth weight*	2.287	1.471	3.02	.041
	Developmental difficulties	0.918	0.553	2.02	.077

Note: Only those variables with p < .10 are shown; [a] df = 1 for chi-square test

The test results show that the effect of one variable in the overall child maltreatment model, having children born low birth weight, randomly varies across the neighborhood units. The variance of the slopes is significant at 5% alpha level ($\chi^2(1)$ = 3.02, p (1-sided) = .041). Another variable, having children with developmental difficulties or delay, also presents randomly varying effects across the neighborhood units but the variance of the variable's effects is only marginally significant ($\chi^2(1)$ = 2.02, p (1-sided) = .077).

A test of the first research question in this study required conducting a multilevel model with a random intercept, which is referred to as a random intercept model (Raudenbush & Bryk, 2002). This model is described using Equations [4] through [13] that describe a series of multilevel models integrating only one random variance, or

[15] Equation [14] is as following:

$$\beta_{1j} = \gamma_{10} + u_{1j} \qquad [14]$$

random intercept. For discussion of Research Question 1-1 and 1-2, we assume that the effects of individual and family level risk factors are fixed as presented in Equations [12] and [13][16], or Var(β_{1j}) = Var(u_{1j}) = τ_{11} = 0 (Raudenbush & Bryk, 2002).

However, since we are now interested in whether and how the effects of individual and family level child maltreatment risk factors are altered by the characteristics of their neighborhood, the model for the effect of individual and family level risk factors should be further developed. The random effect MLM described in Chapter III is utilized to test the Hypothesis 2 of this study. Random effect MLM is described using Equation [14] through [16]. Equation [11], [14], [15], and [16] are shown again for convenience:

$$Y_{ij} = \gamma_{00} + \gamma_{01} Z_j + \beta_{1j} X_{ij} + u_{0j} + r_{ij} \quad [11]$$

$$\beta_{1j} = \gamma_{10} + u_{1j} \quad [14]$$

$$Y_{ij} = \gamma_{00} + \gamma_{01} Z_j + \gamma_{10} X_{ij} + u_{1j} X_{ij} + u_{0j} + r_{ij} \quad [15]$$

$$\text{Var}(u_{1j}) = \tau_{11} \quad [16]$$

[16] Equations [12] and [13] of random intercept multilevel model are:

$$\beta_{1j} = \gamma_{10} \quad [12]$$

$$Y_{ij} = \gamma_{00} + \gamma_{01} Z_j + \gamma_{10} X_{ij} + u_{0j} + r_{ij} \quad [13]$$

Equation [11] represents a random intercept MLM. Equation [14] and [16] represent a random effect assumption conditioning that $\text{Var}(u_{1j}) = \tau_{11} \neq 0$. Equation [15] represents a random effect MLM without a cross-level interaction that incorporates the neighborhood level variable which explains the random effect variance (i.e., τ_{11}).

The first step to build the random effects MLM is to examine whether the effects of the individual/family level risk factors vary significantly across the neighborhood units. This first step relates to Research Question 2-1. The presence of random effects is assured by finding non-zero, or statistically significant variance for individual/family level effects, or $\text{Var}(\beta_{1j}) = \text{Var}(u_{1j}) = \tau_{11} \neq 0$. An illustrative example of significant random effect of lower level variables, or individual/family variables, is presented in Figure 11 of Chapter III.

Detailed likelihood ratio test results are presented in Table 9. In Table 9, both the likelihood ratio test against the reference model described in Equation [13] (i.e., delineating the random intercept MLM with an assumption of fixed individual/family level effects, or $\text{Var}(\beta_{1j}) = \text{Var}(u_{1j}) = \tau_{11} = 0$), and the Wald statistics using point estimate and its standard error were performed but only the results of the likelihood ratio tests are reported. It should be noted that all the random slope components of the child maltreatment model could have been tested simultaneously but it should result in serious estimation problems. This simultaneous analysis was also prohibitive because of extremely slow computation time given that the estimation process of the random parameter in the multilevel design is computationally demanding (Hox, 2002).

In summary, the findings of this study show that the effects of two

Table 9 Variance of random effects in logistic regression models

Random Intercept	Overall Child Maltreatment		
	τ_{00}	SE(τ_{00})	χ^2
Intercept	0.470	0.211	1.77 †
Intraclass correlation	0.064	0.053	
LL	-746.48		
Random Slopes	τ_{11}	SE(τ_{11})	χ^2
Children Factor			
Low birth weight	2.287	1.471	3.02 *
Irritability	-0.006	0.251	0.00
Health	-0.008	0.420	-0.01
Developmental difficulties	0.918	0.553	2.02 †
Parent Factor			
Non White	0.003	0.429	0.00
Education	0.001	0.050	0.00
Gender	0.214	0.131	-0.52
Social support	0.358	0.212	0.94
Age being parent	NA	NA	NA
Alcohol abuse	0.077	0.789	-0.23
Drug abuse	-0.220	0.376	0.16
Self esteem	-0.003	0.215	0.00
Depression	-0.060	0.299	-0.02
Having unwanted baby	0.677	0.234	1.57
Cyclically employed	0.446	0.752	0.22
Never employed	-0.044	0.800	-0.02
Neglected as a child	0.003	0.474	-0.01
Physically abused as child	-0.002	0.380	0.00
Family Factor			
Number of children	0.126	0.296	-0.01
Single parent	0.231	1.115	-0.03
Negative relationship w/ partner	0.350	0.199	1.55
Positive relationship w/ partner	NA	NA	NA
Financial supports	NA	NA	NA
Relationship w/ parents	-0.062	0.381	0.00
Level 1 unit	1532		
Level 2 unit	790		

individual/family level variables, having a baby born with low birth weight and having child with developmental difficulties, are not same across the neighborhood units. This finding warrants further development in the cross-level interaction model. This development is addressed by Research Question 2-2.

Research Question 2-2: *If the effects of individual/family level factors vary significantly across neighborhood units, which neighborhood level conditions are significantly associated with the variation of the effects of the individual/family level factors?*

Research Question 2-2 is answered by testing the significance of the regression coefficients of cross-level interaction terms in the multilevel logistic regression models. Estimations and tests of these cross-level interactions are performed on a variable-by-variable basis again. Also, as recommended in the multiple regression literature (Hox, 2002), both the direct effects in the interaction term were also incorporated into the model and controlled for. Table 10 presents the results of these estimations and tests.

Table 10 Summary of cross-level interactions in child maltreatment

Cross Level Interaction	Overall Maltreatment	
	B	SE(B)
Low birth weight		
X Perceived resources	4.009 **	1.254
Developmental difficulties		
X Violent crime rate	-0.001 †	0.000
X Urbanity	-0.578 *	0.275
X Perceived resources	-1.693 †	0.890

Note: † p<.10 *<.05 **<.01 ***<.001

In the overall child maltreatment model, two individual level variables, having children born low birth weight and having children with developmental difficulties, show the significant random slope variances and, thus, are examined in this section. The results show that there is a significant cross-level interaction between the effect of having children born low birth weight and residents' perception of the neighborhood resources (B = 4.009, S.E. (B) = 1.254, p = .001). Also, the effects of having children with developmental difficulties or delays was altered or marginally altered by neighborhood level violent crime rates (B = -0.001, S.E. (B) < 0.001, p = .074), urbanity of the neighborhood (B = -0.578, S.E. (B) = 0.275, p = .036), and neighborhood residents' perception of neighborhood resources (B = -1.693, S.E. (B) = 0.890, p = .057).

Hypothesis 2-2 is concerned with the question of a cross-level interaction, or moderation, effects between neighborhood level and individual/family level variables. Since it is an interaction, or moderation effect, between variables from two different levels of analysis (i.e., neighborhood and individual/family), it is also referred to as cross-level interaction (Raudenbush & Bryk, 2002). For those individual and family level variables that showed random slopes variances (i.e. $\mathrm{Var}(\beta_{1j}) = \mathrm{Var}(u_{1j}) = \tau_{11} \neq 0$), the neighborhood model of the slopes was further developed using neighborhood level explanatory variables.

As explained in Figure 12 and Equations [17] and [18] of the random-effects MLM, neighborhood level explanatory variable, Z_j, is incorporated into random effect of MLM of Equation [14] to explain the non-zero random effects, $\mathrm{Var}(\beta_{1j}) = \mathrm{Var}(u_{1j}) = \tau_{11,}$ of

individual/family level variables.[17] Equation [18] is presented again for convenience in the following.

$$\begin{aligned} Y_{ij} &= \gamma_{00} + \gamma_{01} Z_j + (\gamma_{10} + \gamma_{11} Z_j + u_{1j}) X_{ij} + u_{0j} + r_{ij} \\ &= \gamma_{00} + \gamma_{01} Z_{1j} + \gamma_{10} X_{ij} + \gamma_{11} Z_j X_{ij} + u_{1j} X_{ij} + u_{0j} + r_{ij} \end{aligned} \qquad [18]$$

The cross-level interaction, or moderation, effects in MLM is manifested by a significant regression coefficient, γ_{11}, of cross-level interaction term, $Z_j X_{ij}$, in Equation [18].

The conceptual frameworks of random-effects MLM and child maltreatment model are illustrated in Figures 12 and 4, respectively, and the arrows from neighborhood level variables to the effects of individual/family level variables represent the cross-level interaction, or moderation, effect in these hypothesis tests. Figure 4, shown again for convenience, represents the cross-level interaction by the black solid arrow from neighborhood level factors to the arrows from individual/family level variables to the dependent variable, child maltreatment.[18]

In summary, for overall child maltreatment, some findings of this section are counter-intuitive. First of all, parents having children with low birthweight are more likely to commit child maltreatment when they live in a neighborhood with higher

---

[17] Equations [14] and [17] are:

$$\beta_{1j} = \gamma_{10} + u_{1j} \qquad [14]$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} Z_j + u_{1j} \qquad [17]$$

[18] In Figure 4 shown below, all the other parts but the arrows representing the cross-level interactions are shaded for the purpose of emphasis.

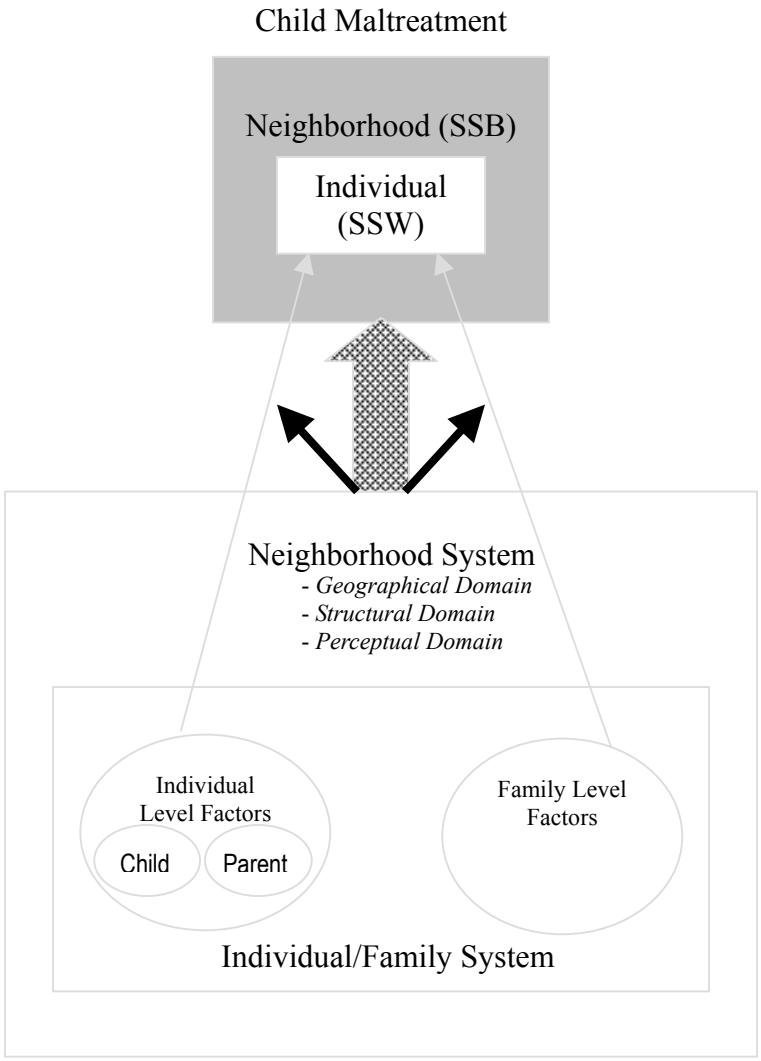


Figure 4 Conceptual model of child maltreatment proposed in this study

average level of perceived neighborhood resource than they live in a neighborhood of lower perceived neighborhood resources. Also, parents having children with developmental difficulties are less likely to abuse their children when they live in a neighborhood that has a higher violent crime rate, is more urbanized, and has higher level of perceived neighborhood resources than others.

Research Question 3: Contrasting Child Physical Abuse and Child Neglect

> **Research Question 3***: Is the model for parents' risk of neglecting their children different from that of physically abusing their child? If it is, how different?*

Research Question 3 is addressed by comparing the multilevel logistic regression models with different dependent variables, child neglect and physical abuse, but using the same set of independent variables. No formal statistical tests are available and conducted to answer this question. However, to explore how the etiological models differ by type of maltreatment, the models are compared to each other by examining the risk factors that are significant at the 5% alpha level.

In this section, each level of the human ecological system is compared across the types of child maltreatment in more detail. It is followed by a comparison of random effects of slopes and cross-level interactions that were examined in Research Question 2 of this study, but, with overall child maltreatment as the dependent variable.

Child Factor

None of the child level variables examined in this study are significant risk

factors for both child physical abuse and neglect. For example, children born with low birth weight and children's high level of developmental difficulty or delay are significant risk factors of child neglect but not of physical abuse at the 5% alpha level. On the other hand, a high level of irritability and general health status are significant risk factors for physical abuse, but are not for child neglect. Results are summarized in Table 11.

Table 11 Comparison of child factors by maltreatment type

Child Factor	Physical Abuse		Neglect		Any Maltreatment	
	B	SE(B)	B	SE(B)	B	SE(B)
Low birth weight	0.317	0.373	0.570 *	0.250	0.383 †	0.223
Irritability	0.386 **	0.116	-0.025	0.083	0.093	0.069
Health	-0.499 *	0.220	-0.129	0.137	-0.040	0.113
Developmental difficulties	0.383 †	0.226	0.365 *	0.158	0.441 **	0.137

Note: †p<.10 *<.05 **<.01 ***<.001

When examined for each type of child maltreatment, having children born with low birth weight (B = 0.570, S.E. (B) = 0.250, p = .023) and children's high level of developmental difficulty or delay (B = 0.365, S.E. (B) = 0.158, p = .021) are positively associated with parents' risk for neglecting their children. More specifically, parents who have one or more children born with low birth weight (i.e., < 5 lbs 8 oz (2,500g)) are about 77% more likely to neglect their children. Also, parents of children whose level of developmental difficulties was in the highest 10% of the study sample, were about 50% more likely to neglect their children than those whose children's level of developmental difficulties was in the lowest 10%. However, the parents presented same risk of

physically abusing their children.

On the other hand, variables such as higher irritability (B = 0.386, S.E. (B) = 0.116, p = .001) and child's health (B = -0.499, S.E. (B) = 0.220, p = .023) are significantly associated with the parents' higher risk of child physical abuse. However, these variables are not significant risk factors of child neglect. In other words, the parents of those children whose irritability was in the highest 25% of the study sample, were about 64% more likely to physically abuse their children than those whose children's irritability was at lowest 25% in this study sample. However, the parents were not different in terms of the risk of neglecting their children.

Parent Factor

The parent level risk factors identified in this study vary again by the type of maltreatment. Parent level risk factors that are significant in the child neglect model are not significant in the physical abuse model and vice versa. Results of separate multilevel logistic regression analyses results are presented in Table 12.

As shown in Table 12, parent's gender (B = -0.629, S.E. (B) = 0.220, p = .004), level of depression (B = 0.249, S.E. (B) = 0.088, p = .005), and history of being neglected as children (B = 1.087, S.E. (B) = 0.181, p < .001) are positively associated with the risk of neglecting their children. More explicitly, male are about 88% more likely to neglect their children than female parental figures assuming all the other conditions same. Those who with higher levels of depression are also at higher risk of neglecting their children. Moreover, those who were neglected as children are at almost three times higher risk of

neglecting their children than those who without a history of neglect. However, none of these variables serve as valid risk factors for physical abuse.

Table 12 Comparison of parent factors by maltreatment type

Parent Factors	Physical Abuse		Neglect		Any Maltreatment	
	B	SE(B)	B	SE(B)	B	SE(B)
Non White	-0.018	0.325	-0.010	0.229	0.007	0.972
Education	0.028	0.076	0.094 †	0.053	0.035	0.428
Gender	0.289	0.328	-0.629 **	0.220	-0.229	0.219
Social support	0.046	0.139	0.016	0.097	-0.043	0.591
Age being parent	-0.232 ***	0.066	-0.058	0.045	-0.105 **	0.006
Alcohol abuse	0.174	0.118	-0.039	0.098	0.021	0.787
Drug abuse	0.250 **	0.090	0.001	0.087	0.168 *	0.015
Self esteem	0.155	0.126	-0.059	0.092	-0.027	0.720
Depression	-0.198	0.136	0.249 **	0.088	0.088	0.242
Having unwanted baby	0.123	0.255	-0.146	0.176	0.006	0.967
Cyclically employed	-0.982 ***	0.278	0.129	0.182	-0.296 †	0.052
Never employed	0.354	0.352	0.372	0.275	0.128	0.578
Neglected as a child	-0.018	0.250	1.087 ***	0.181	0.671 ***	0.000
Physically abused as child	1.666 ***	0.267	-0.073	0.195	0.483 **	0.002

Note: † p<.10 *<.05 **<.01 ***<.001

Other risk factors such as becoming parent at a young age (B = -0.232, S.E. (B) = 0.066, p < .001), higher levels of drug abuse (B = 0.250, S.E. (B) = 0.090, p = .006), cyclically employed as opposed to consistently employed (B = -0.982, S.E. (B) = 0.278, p < .001), and being physically abused as children (B = 1.666, S.E. (B) = 0.267, p < .001) were significant after controlling for the effects of child and family level risk factors included in the physical abuse model. In other words, a person who became a parent one year earlier than others is about 26% more likely to physically abuse his/her child after

controlling for the effects of other factors. In addition, higher levels of drug abuse are associated with the abusers' higher risk of physically abusing their children. Those who scored in the top 10% for drug abuse scale in the sample, were about twice as likely to physically abuse their children as those who were in the bottom 10% of the drug abuse scale. Similar to the child neglect model, only the same type of abuse history is a significant risk factor for this model. Those who had the history of being physically abused as children are at more than five times greater risk of physically abusing their own children. Again, none of these risk factors function as significant risk factors for child neglect.

Most interestingly, while a childhood history of neglect and physically abuse are highly significant risk factors in the overall child maltreatment model, results from the type-specific child maltreatment models reveal that those who were physically abused are more likely to physically abuse, not neglect, their children and those who were neglected as children are more likely to neglect, not physically abuse, their children. Findings from this study not only confirm the hypothesis of the intergenerational transmission of child maltreatment, but also suggest that only the same type of maltreatment is transmitted to the next generation.

Family Factors

An examination of family level factors' effects on each type of child maltreatment, once again, reveals that there are different patterns for child neglect and physical abuse. Briefly, none of the family level risk factors included in this study are

statistically significant at the 5% alpha level while two variables, number of children and single parenthood, are marginally associated with parent's risk of physically abusing his/her child. A summary of analyses results is shown in Table 13.

None of the family level risk factors incorporated in the child neglect model are significant even at 10% alpha level. This finding suggests that, after taking the effect of the individual level risk factors into account, the family level risk factors found in the previous child maltreatment research do not satisfactorily explain the occurrence of child neglect.

Table 13 Comparison of family factors by maltreatment type

Family Factor	Physical Abuse		Neglect		Any Maltreatment	
	B	SE(B)	B	SE(B)	B	SE(B)
Number of children	-0.352 †	0.191	0.171	0.121	-0.083	0.441
Single parent	0.518 †	0.272	0.167	0.195	0.270 †	0.096
Negative relationship w/ partner	0.024	0.110	-0.098	0.091	0.085	0.217
Positive relationship w/ partner	0.012	0.190	-0.082	0.138	0.017	0.882
Financial supports	0.001	0.045	0.022	0.032	0.001	0.983
Relationship w/ parents	-0.016	0.121	-0.115	0.093	-0.035	0.637

Note: † p<.10 *<.05 **<.01 ***<.001

On the other hand, single parenthood (B = 0.518, S.E. (B) = 0.272, p = .057) and number of children in households (B = -0.352, S.E. (B) = 0.191, p = .065) are risk factors that are marginally significant in the physical abuse model, after controlling for the effects of other individual level risk factors. Those parents who raise their children without other parental figures in their household are about 68% more likely to physically abuse their children than those who have other parental figures, after taking other

individual level and family level risk factors' effects into account. Also, having one more child in the household decreases the risk of physical maltreatment by about 30% net of the effects of other variables.

Neighborhood Factors

Before comparing each neighborhood level variable's effect on child maltreatment, the question about whether there is a significant neighborhood level variance of child neglect and physical abuse that we examined in Research Question 1-1 is addressed. Table 14 presents the summary of test results for the neighborhood level random variance of child neglect and physical abuse.

Table 14 Comparison of neighborhood level variance by maltreatment type

Statistics	Physical Abuse			Neglect			Any Maltreatment		
Wald test	τ_{00}	SE(τ_{00})	p	τ_{00}	SE(τ_{00})	p	τ_{00}	SE(τ_{00})	p
	1.038	0.256	<.001	0.541	0.234	.021	0.473	0.210	.024
Likelihood ratio test	-2ΔLL	df	p	-2ΔLL	df	p	-2ΔLL	df	p
	10.62	1	.001	1.71	1	.096	1.77	1	.092

Likelihood ratio test results show that prevalence rates of physical abuse, after controlling for the effect of individual and family level risk factors in the physical abuse model, vary significantly across the neighborhood units ($\chi^2(1) = 10.62$, p (1-sided) < .001). However, the same test results for child neglect is slightly different from that for physical abuse. This suggests that the neighborhood level variance of child neglect, after

taking individual/family level variables' effects into account, is only marginal ($\chi^2(1)$ = 1.71, p (1-sided) = .096).

Given that the neighborhood level variances of child neglect and physical abuse are either marginal or significant, neighborhood level variables are incorporated into each multilevel logistic regression model and compared to each other. The results are presented in Table 15.

Table 15 Comparison of neighborhood factors by maltreatment type

Neighborhood Factors		Physical Abuse		Neglect		Any Maltreatment	
		B	SE(B)	B	SE(B)	B	SE(B)
Structural	Ethnic heterogeneity	-0.482	0.591	-0.085	0.388	-0.287	0.335
	Residential mobility	-0.069	0.132	-0.071	0.095	-0.069	0.079
	SES	0.235	0.197	0.268 *	0.135	0.187	0.114
	Proportion single household	-0.090	0.169	-0.146	0.115	-0.097	0.099
	Housing quality	0.097	0.138	0.049	0.090	0.074	0.080
	Violent crime rate	0.001 †	0.000	0.001 **	0.000	0.001 **	0.000
Perceptual	Network	-0.948	0.801	-0.273	0.511	-0.030	0.426
	Happiness	-0.187	0.491	0.071	0.333	-0.046	0.283
	Safety	0.128	0.702	-0.367	0.455	-0.006	0.405
	Resource	0.639	0.598	-0.058	0.451	0.202	0.372
Geographical	Urbanity	0.193	0.335	-0.111	0.233	-0.264	0.193
	Region: Midwest	-0.579	0.447	-0.050	0.314	-0.145	0.257
	Region: South	-0.871 *	0.414	0.010	0.273	-0.342	0.232
	Region: Northeast	0.477	0.463	-0.070	0.383	0.406	0.294
	τ_{00}	0.936 ***	0.257	0.497	0.241	0.449 *	0.214
	LL=	-337.87		-559.23		-735.97	
	χ^2=	7.40 **		1.36		1.48	

Note: † p<.10 *<.05 **<.01 ***<.001

In the physical abuse model, only one variable, living in the Southern region of

the US compared to Eastern (B = -0.871, S.E. (B) = 0.414, p = .035), is negatively associated with neighborhood level prevalence rates of physical abuse, while the effect of neighborhood level violent crime rate is marginal (B = 0.001, S.E. (B) = < .001, p = .062).

In the child neglect model, two variables in the structural domain of the neighborhood model, low socioeconomic status (B = 0.268, S.E. (B) = 0.135, p = .046) and high violent crime rate (B = 0.001, S.E. (B) < 0.001, p = .003) yielded statistical significance in the final model, even after taking the effects of all the individual and family level risk factors into account.

Random effects of slopes

The question of a significant variance in the effects, or slopes, of individual/family level variables to child neglect and physical abuse, which was examined in Research Question 2-1, is addressed again but using the different dependent variables of child neglect and physical abuse. Results are compared to each other by type of maltreatment. Table 16 presents the summary statistics that test the variance of random slopes across neighborhood units to answer this question.

Table 16 Comparison of random variance of slopes by maltreatment type

Dependent variable	Independent variable	τ_{11}	SE(τ_{11})	-2ΔLL[a]	p
Physical abuse	*Number of children*	0.702	0.254	2.08	.075
	Negative relationship w/ partner	0.773	0.310	4.85	.014
Child neglect	*Having unwanted baby*	0.810	0.261	2.23	.068

Note: Only those variables with p < .10 are shown; [a] df = 1 for chi-square test

In the child physical abuse model of this study, the likelihood ratio test result of the random slope variance shows that the effect of the violent relationship between parental figures significantly varies across neighborhoods ($\chi^2(1) = 4.85$, p (1-sided) = .014). The effect of number of children in the household on the parents' risk of committing physical abuse also showed marginally significant variance across the neighborhood units ($\chi^2(1) = 2.08$, p (1-sided) = .075).

In the child neglect model, none of the variables in the model present randomly varying effects across the neighborhood units at the conventional 5% alpha level. Only one variable, having an unwanted baby, shows marginal significance in the likelihood ratio test ($\chi^2(1) = 2.23$, p (1-sided) = .068) of random effects.

Cross-level interactions

Given that there are significant variances in the effects of individual/family level variables on each type of child maltreatment, cross-level interaction is again examined by different type of maltreatment, child neglect and physical abuse, and compared to each other. Results of the comparison are presented in Table 17.

In the physical abuse model, the effects of number of children in household and domestic violence shows significant random slope variances. The examination of further cross level interactions of those variables with neighborhood level variables reveals that the effects of the number of children in households marginally interacts with neighborhood level violent crime rate (B = 0.001, S.E. (B) < 0.001, p = .090) and with

the neighborhood level proportion of at risk children (B = 0.309, S.E. (B) = 0.152, p = .042). Also, the significant interactions of violent partner relationship both with neighborhood level average housing quality (B = 0.219, S.E. (B) = 0.110, p = .046) and, although marginal, with neighborhood residents' perception of neighborhood safety (B = 1.387, S.E. (B) = 0.720, p = .054) are present in the physical maltreatment model.

Table 17 Comparison of cross level interactions by maltreatment type

Cross Level Interaction	Physical Abuse		Neglect	
	B	SE(B)	B	SE(B)
Number of children				
X Violent crime rate	0.001 †	0.000		
X Proportion of at risk children	0.309 *	0.152		
Violent relationship w/ partners				
X Housing quality	0.219 *	0.110		
X Perceive safety	1.387 †	0.720		
Having unwanted baby				
X Mobility			0.342 †	0.176
X Average SES			0.481 **	0.171
X Perceived network			-3.246 **	0.940

Note: † p<.10 *<.05 **<.01 ***<.001

In other words, the protective effect of number of children in household on physical abuse is lowered when they live in a neighborhood that is higher in violent crime rate or proportion of at-risk children. Parents in violent relationships with their partners are more likely to physically abuse their children if they live in a neighborhood that is proportionally higher in low quality housing and in the level of perceived safety.

The effects of having an unplanned baby showed the random slope variance in the child neglect model and, consequently, the cross level interactions of this variable and

various neighborhood level variables were explored. Among those variables explored, neighborhood level mobility (B = 0.342, S.E. (B) = 0.176, p = .051), neighborhood level average socioeconomic status (B = 0.481, S.E. (B) = 0.171, p = .005), and neighborhood residents' perception of neighborhood level network (B = -3.246, S.E. (B) = 0.940, p = .001) did significantly or marginally significantly interact with the effect of having unintended baby in the child neglect model.

The cross level interaction found in the child neglect model can be interpreted as follows: parents with an unwanted baby are more likely to neglect their children if they live in a neighborhood with higher mobility or lower average SES while less likely to neglect if they live in a neighborhood with, in average, high level of perceived network than others.

In summary of Research Question 3, the examination of the pattern of significant risk factors in each model reveals that those risk factors, which are significant in the model for one type of child maltreatment, are not significant in the other type of child maltreatment model for individual/family level factors. Furthermore, neighborhood level risk factors included in the type specific child maltreatment models also show different patterns across the different types of maltreatment. Findings from the comparison of different types of child maltreatment are summarized as follows:

- None of the individual/family level variables incorporated in this study are significant both in child neglect and physical abuse model;
- In neighborhood factors of child maltreatment, the results show that

geographical region and, possibly, violent crime rate are significant neighborhood characteristics that are associated with child physical abuse while average socioeconomic status and violent crime rate are associated with child neglect;

- In the physical abuse etiological model, the effects of number of children and parent's violent relationship with partner on physical abuse and the effects of having an unwanted baby on child neglect significantly vary across neighborhood units in this study;
- Examination of cross level interactions reveal that the effects of number of children on physical abuse is altered by proportion of at risk children in neighborhood and, marginally, by violent crime rate. Also, average housing quality and, possibly, perceived neighborhood safety interact with the effect of domestic violence on child physical abuse; and
- On the other hand, in the child neglect model, average SES, perceived neighborhood network, and, possibly, residents' mobility alter the effect of having an unwanted baby on child neglect.

Research Question 4: Four Neighborhood Process Models

Research Question 4*: Among the existing process models of neighborhood factors (i.e., social disorganization theory, collective efficacy model, institutional resource model, and social stress model), which is most effective in explaining the neighborhood effects on child maltreatment?*

In this section, four neighborhood process models are tested to understand their

utilities in explaining the neighborhood process of child maltreatment. These four neighborhood models originate from various disciplines. Although the neighborhood level models are derived from previous studies on the child maltreatment and tested in Research Question 1 and 2 of this study, the test of these neighborhood process models from other discipline is conducted to see if there are any other variables or perspectives that we have to take into account in the neighborhood level model of child maltreatment. This hypothesis was tested by conducting a likelihood ratio test of the model, which incorporates the individual and family level factors (Model 6), along with other models, which added a set of neighborhood level indicators that are critical for each neighborhood process model. It should be noted that the test results are reported by different type of child maltreatment as the findings from Research Question 3 propose that there should be distinct etiological models by type of maltreatment.

Social Disorganization Theory

The test result shows that the social disorganization theory represented by four indicators: (1) neighborhood residential mobility; (2) ethnic heterogeneity; (3) neighborhood housing quality; and (4) proportion of single households, is not a useful neighborhood model in child maltreatment context. Test results are shown in Table 18.

When all the variables were included in the model to test the improvement in the model fit, the result indicated that the inclusion of variables from the social disorganization theory failed to significantly improve the overall model fit ($\chi^2(4) = 2.067$, p (2-sided) = .723). Moreover, none of the variables were significant in the overall child

maltreatment model.

Table 18 Test of social disorganization theory in child maltreatment

	Any Abuse		Physical Abuse		Neglect	
Model 6 (individual/family model) +	*B*	SE(*B*)	*B*	SE(*B*)	B	SE(B)
Social Disorganization						
Neighborhood Mobility	-0.009	0.074	0.011	0.129	-0.006	0.090
Ethnic Heterogeneity	-0.086	0.300	0.243	0.535	0.025	0.353
Housing Quality	0.095	0.071	0.018	0.125	0.134	0.079 †
% Single Households	0.031	0.074	0.022	0.127	0.053	0.086
τ_{00}	0.480	0.209 †	1.046	0.260 ***	0.555	0.232 †
-2ΔLL	2.067		0.271		3.327	

Note: † p<.10 *<.05 **<.01 ***<.001

For maltreatment type specific models, the social disorganization theory was not very effective either for the child physical abuse model ($\chi^2(4) = 0.271$, p (2-sided) = .992) or for the neglect model ($\chi^2(4) = 3.327$, p (2-sided) = .505).

Collective Efficacy Theory

The likelihood ratio test result of the collective efficacy theory shown in Table 19 indicates that the collective efficacy theory does not significantly improve the overall model fit ($\chi^2(1) = 0.026$, p (2-sided) = .873). Furthermore, overall efficiency of the collective efficacy model in explaining child maltreatment was not significant in either the physical abuse model ($\chi^2(1) = 0.852$, p (2-sided) = .356) or the child neglect model ($\chi^2(1) = 0.334$, p (2-sided) = .563).

Table 19 Test of collective efficacy theory in child maltreatment

	Any Abuse		Physical Abuse		Neglect	
Model 6 (individual/family model) +	*B*	SE(*B*)	*B*	SE(*B*)	B	SE(B)
Collective Efficacy						
Perceived Neighborhood Network	-0.061	0.383	-0.651	0.719	-0.266	0.462
τ_{00}	0.471	0.211 †	1.036	0.257 ***	0.530	0.238 *
-2ΔLL	0.026		0.852		0.334	

Note: † p<.10 *<.05 **<.01 ***<.001

The variable of the collective efficacy theory that was included in the model was the residents' perceptions of their neighborhood network. Available measures for the collective efficacy theory were very limited in this study and none of the available questions in Wave III of this study were related to the key variables of the collective efficacy theory. Residents' perception of neighborhood network was the primary variable that was available in the Add Health study.

Social Stress Theory

Results of the likelihood ratio test showed that the social stress model marginally, but significantly improved the overall model fit of the overall child maltreatment model ($\chi^2(2) = 5.491$, p (2-sided) = .064) and the child neglect model ($\chi^2(2) = 5.951$, p (2-sided) = .051) as well. However, it failed to improve the model fit significantly when the variables of the social stress model were included into the physical abuse model ($\chi^2(2) = 1.091$, p (2-sided) = .580). Test results are shown in Table 20.

Table 20 Test of social stress theory in child maltreatment

	Any Abuse		Physical Abuse		Neglect	
Model 6 (individual/family model) +	*B*	SE(*B*)	*B*	SE(*B*)	B	SE(B)
Social Stress						
Perceived Neighborhood Safety	-0.139	0.374	-0.148	0.644	-0.475	0.422
Crime Rate	0.173	0.079 *	0.130	0.135	0.177	0.094 †
τ_{00}	0.465	0.211 †	1.030	0.256 ***	0.551	0.228 †
-2ΔLL	5.491 †		1.091		5.951 †	

Note: † p<.10 *<.05 **<.01 ***<.001

The available measures, which related to social stress theory, in the Add Health study were residents' perception of safety in their neighborhood and their neighborhood level crime rate. Between the two measures, the neighborhood crime rate was positively associated with the neighborhood level prevalence rate of overall child maltreatment (B = 0.173, S.E. (B) = 0.079, p = .028) and also, although marginal, with that of child neglect (B = 0.177, S.E. (B) = 0.094, p = .060).

Community Institutional Resource Model

The likelihood ratio test of the model, which includes the indicators of the community institutional resource model, was conducted for each type of child maltreatment as a dependent variable. The results are shown in Table 21.

The test results showed that the community institutional resource model had significant explanatory power for rates of child physical abuse in the neighborhood context ($\chi^2(6) = 13.888$, p (2-sided) = .031). However, the same neighborhood process model did not significantly contribute to explaining the prevalence rate of overall child

abuse ($\chi^2(6) = 8.768$, p (2-sided) = .187) or child neglect ($\chi^2(6) = 6.184$, p (2-sided) = .403).

Table 21 Test of institutional community resource model in child maltreatment

	Any Abuse		Physical Abuse		Neglect	
	B	SE(*B*)	*B*	SE(*B*)	B	SE(B)
Institutional Community Resource						
Perceived Neighborhood Resource	0.065	0.364	0.583	0.583	-0.245	0.449
% State Expenditure to Housing & Environment	-0.005	0.006	-0.035	0.014 *	0.001	0.007
% State Expenditure to Health Promotion	0.067	0.076	0.085	0.140	0.120	0.089
% State Expenditure to Police Protection	0.084	0.079	0.227	0.138	0.028	0.095
% County Expenditure to Education	0.006	0.085	-0.156	0.158	0.010	0.102
% State Expenditure to Education	-0.159	0.081 *	-0.124	0.154	-0.157	0.094 †
τ_{00}	0.439	0.220	0.937	0.266 ***	0.495	0.252
-2ΔLL	8.768		13.888 *		6.184	

Note: † p<.10 *<.05 **<.01 ***<.001

Neighborhood residents' perception of available community resources and the proportion of state and county government expenditures on education, health promotion, environment and housing, and police protection were the available indicators that were considered important in the community resource model. Among those indicators included in the community resource model of neighborhood process, the proportion of state level expenditures on environment and housing (B = -0.027, S.E. (B) = 0.013, p = .030) was significantly associated with the neighborhood level prevalence of child physical abuse, after controlling for the effects of individual and family level risk factors. The proportion

of state level expenditures on education (B = -0.159, S.E. (B) = 0.081, p = .050) was also significantly associated with the overall child maltreatment prevalence rate of neighborhoods. The negative association between the expenditures on environment and housing and the prevalence of child physical abuse suggests the local government efforts to improve the quality of the general environment and housing conditions contribute to reducing the prevalence rate of child physical abuse in neighborhoods. Likewise, the local governments' efforts to improve the education system contributed to reducing overall child maltreatment in the neighborhood.

In summary, the results of this study suggest that only two of four neighborhood process models are somewhat effective when applied to child maltreatment context. The institutional community resource model is clearly effective in explaining neighborhood level prevalence rate of physical abuse. The social stress model was marginally effective (i.e., at 10% alpha level) in explaining the neighborhood level variance. The remaining two models, social disorganization and collective efficacy models, were not useful as explanatory framework of neighborhood dimension of child maltreatment.

Individual and Family Level Models: Preliminary Models

In this section, only those multilevel logistic regression models with individual and family level variables are explained. Although this section is not directly related to answering the research questions in this study, it presents several interesting findings regarding the association between individual and family level variables and child

maltreatment. Table 22 summarizes the models presented in this section.

These models are referred to as preliminary models because, although they are multilevel models, higher level, or neighborhood variables are not incorporated into the model. Overall, Model 0 is the baseline model equivalent to a one-way random effect ANOVA model. This model is explained using Figure 6 and Equation [6][19] of Chapter III in which the variance of the dependent variable is divided into two components: between-neighborhood, or neighborhood level, variance (i.e., $\text{Var}(r_{ij}) = \tau_{00}$) and within-neighborhood, or individual level, variance (i.e., $\text{Var}(u_{0j}) = \sigma^2$).

Table 22 Sumamry of individual and family level models

Model	Independent variables incorporated
Model 0	None
Model 1	Child: Individual
Model 2	Parent: Individual
Model 3	Family
Model 4	Child + Parent: Individual
Model 5	Parent + Family
Model 6	Child + Parent + Family

Model 1 through 6 incorporate various combinations of explanatory variables from the individual and family level. As explained using Figure 8 and Equation [8][20] in

[19] Equations mentioned in earlier chapters will be shown again for convenience in the following chapter. Equation [6] is:

$$Y_{ij} = \gamma_{00} + u_{0j} + r_{ij} \qquad [6]$$

[20] Equation 8 is:

$$Y_{ij} = \beta_{0j} + \beta_{1j} X_{ij} + r_{ij} \qquad [8]$$

Chapter III, these models incorporate sets of individual level explanatory variables (X_{ij}'s) to explain the within-neighborhood variance component (i.e., Var(u_{0j}) = σ^2) of the dependent variable. Most notably, Model 6 is the most comprehensive individual/family level model that includes all of the explanatory variables from the individual and family level. Child maltreatment models utilized in the Preliminary Models is again displayed in Figure 15.

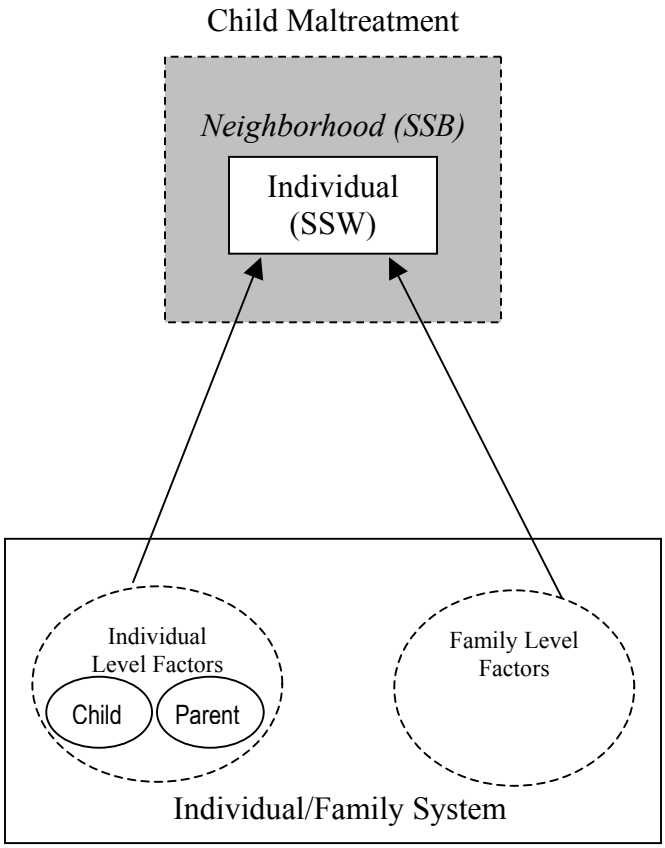


Figure 15 Illustration of Model 1-6 and test of Hypothesis 1-1

Table 23 shows a series of multilevel logistic regression analyses results, which were designed to test the Hypothesis 1-1 of this study: *Does the likelihood of child maltreatment vary significantly across* neighborhood *units after taking the effect of individual and family level factors into account?* However, results displayed in Table 23 provide an overall picture of the models in this study as well.

Model 0 is the null model in which the random intercept (β_{0j} in Equation [4]) is considered as the only predictor of the dependent variable. Model 0 also served as the reference model when examining whether the inclusion of other predictor variables significantly improved the overall fit. Models 1 through 3 were implemented to separately evaluate the contributions of child, parent, and family factors on child maltreatment, respectively. The likelihood ratio test results show the child ($\chi^2(5) = 44.84$, $p < .001$), parent ($\chi^2(12) = 94.59$, $p < .001$), and family ($\chi^2(6) = 22.18$, $p = .001$) factors significantly improved the overall model fit even when they were included separately. In sum, each factor as a separate set of variables (i.e., child, parent, and family factors) contributes to improving the child maltreatment model in terms of better explaining the etiology of child maltreatment.

Child Factors

As stated before, the likelihood ratio test result of Model 1 shows that the child factor, as a set of variables, is significantly associated with the parent's risk of abusing their children ($\chi^2(5) = 44.84$, $p < .001$). Furthermore, Model 4 was estimated to examine whether each variable within the child factor and the child factor as a whole add any

Table 23 Multilevel child maltreatment model with individual/family level variables

		Model 0	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
		B	B	B	B	B	B	B
Child	Low birth weight (< 2,500g)		0.311			0.427 †		0.425 †
	Irritability		0.155 †			0.085		0.096
	Health		-0.022			-0.037		-0.030
	Developmental difficulties		0.413 ***			0.403 **		0.429 **
	Age(Baby)		0.141 ***					
Parent	Non White			0.258 †		0.241 †	0.200	0.181
	Education			0.027		0.038	0.021	0.031
	Gender			-0.126		-0.117	-0.214	-0.229
	Social support			-0.020		-0.026	-0.029	-0.040
	Age being parent			-0.105 **		-0.098 **	-0.096 *	-0.099 **
	Alcohol abuse			0.023		0.027	0.002	0.000
	Drug abuse			0.160 *		0.170 *	0.155 *	0.162 *
	Self esteem			-0.066		-0.049	-0.066	-0.051
	Depression			0.160 *		0.123 †	0.138 †	0.101
	Having unwanted baby			0.007		-0.004	-0.011	-0.018
	Cyclically employed			-0.291 *		-0.296 *	-0.278 †	-0.278 †
	Never employed			0.094		0.063	0.135	0.122
	Neglected as a child			0.636 ***		0.630 ***	0.650 ***	0.642 ***
	Physically abused as child			0.499 **		0.490 **	0.498 **	0.490 **
Family	Number of children				0.164 †		0.024	-0.072
	Single parent				0.304 *		0.287 †	0.299 †
	Violent relationship w/ partner				0.175 **		0.090	0.082
	Loving relationship w/ partner				-0.035		0.031	0.024
	Financial supports				-0.005		-0.001	-0.002
	Relationship w/ parents				0.066		-0.032	-0.025
	τ_{00} [c]	0.412 *	0.368	0.424 †	0.412 *	0.431 †	0.460 *	0.472 *
	LL=	-805.14	-782.72	-757.41	-794.05	-749.68	-754.51	-746.48
	Chi²=	1.53 [b]	44.84 ***	94.59 ***	22.18 **	16.32 **		16.06 **, [a]
								1.77 †, [b]

Note: †<.10, *p<.05, **<.01, ***<.001, a: Model 0 as a reference, b: simple (non-multilevel) logistic regression model as a reference, c: Wald test result
DV: Overall child maltreatment, N (individual)= 1532, N(neighborhood) = 790

further explanatory power over and above the effects of the parent factor. The likelihood ratio test results of Model 4 compared to Model 2 (i.e., parent factor only model) ($\chi^2(4) = 16.32$, $p = .003$) confirm the hypothesis that children's characteristics are associated with parents' abusive behaviors even after controlling for the effect of the parent factor. However, this result must be interpreted with caution before assuming any causal relationship between the children's factor and the increased risk of being abused. This issue will be discussed in more detail in the next chapter. Comparison of Model 5 (i.e., Parent + Family) and 6 (i.e., Child + Parent + Family) shows that the previous finding regarding the child factor's significant contribution to the etiology of child maltreatment was retained even after controlling for the effects of the variables in the family factor as well as the parents factor ($\chi^2(4) = 16.06$, $p = .003$).

Model 6 presents the level-1 full model, which includes all the proposed risk factors of child maltreatment at the individual (i.e., child and parent) and family levels. Closer examination of each variable in the Model 6 suggests that having children with a higher level of developmental delay or difficulties (B= 0.429, S.E. (B) = 0.137, p = .002) and low birth weight (B= 0.425, S.E. (B) = 0.223, p = .057), which are highly correlated with premature births, are associated with a higher risk of parents' committing child abuse, after controlling for the effect of parent and family factors. In other words, those who have children born at a low birth weight (i.e., < 5 lbs 8 oz) are about one and a half times more likely to abuse their children[21]. Also, parents who have children with

[21] Interpretation of the logistic regression coefficient, B, can be done after anti-log transformation of the coefficient. In other words, since the logistic regression utilized the logit link of

developmental difficulties or delays are also about one and a half times more likely to abuse their children. However, children's irritability (B= 0.096, S.E. (B) = 0.069, p = .165) and general health status (B= -0.030, S.E. (B) = 0.113, p = .793) are not significantly associated with parents' risk of abusing their children when the parent and family factors are taken into account.

In Model 1, the oldest child's age was included and controlled for in the model because that was the length of time the parents were exposed to any possible risk of child maltreatment. However, this variable was excluded in the subsequent models because of its multicollinearity with the respondents' age of becoming parent. This high correlation between the two variables emerged from the fact that the ages of the participants in the Add Health study were relatively homogenous.

Parents Factor

Likelihood ratio test results of Model 2 (i.e., logistic regression with the explanatory variables of parent factor only) show that the parent factors are significantly associated with the risk of abusing their children ($\chi^2(14) = 94.59$, $p < .001$). Among the variables in the parent factor that were included in Model 6 of Table 23, parent's age of

---

$\eta_{ij} = \log\left(\frac{\varphi_{ij}}{1-\varphi_{ij}}\right)$, anti-log transformation of the coefficient, or exponentiation of B (=exp(B)), was utilized to produce the odd ratios. In the interpretation of B coefficient for "low birth weight", anti-log transformation of B produced exp(0.425) = 1.530, which is the odd ratio of abusing children between those who have children born low birth weight (i.e., "low birth weight" = 1) and those who do not have (i.e., "low birth weight" = 0). It can be stated that: *Those parents who have children born low birth weight are about one and a half times more likely to abuse their children than those who do not*; or *Those parents who have children born low birth weight are about 50% more likely to abuse their children than those who do not*.

becoming parent, drug abuse, and history of being neglected or physically abused as child are significantly associated with the likelihood of abusing children. More specifically, parent's age at the time of giving birth was negatively associated with likelihood of child abuse (B= -0.099, S.E. (B) = 0.038, p = .009). This result suggests that becoming parents at an early age is a significant predictor of abusing their children. More specifically, a person, who becomes a parent one year earlier than others, is about 10% more likely to abuse his/her child, after controlling for the effects of other factors. The result of Model 6 shows that parent's higher level of drug abuse is also associated with increased risk of child abuse (B= 0.162, S.E. (B) = 0.069, p = .019). Also, both a history of being neglected (B= 0.642, S.E. (B) = 0.144, p < .001) and a history of being physically abused (B= 0.490, S.E. (B) = 0.156, p = .002) as a child are significant predictors of a parent's subsequent abuse of his/her own children. This significant association between parent's history of being neglected/physically abused and increased likelihood of abusing their own children confirms the intergenerational transmission of child abuse hypothesis. More specifically, being neglected as children increases the likelihood of abusing their own children as parents by 90% while being physically abused as children increases the likelihood of abuse by 63%.

Parents' demographic characteristics such as race, gender, education level, and employment status do not show significant associations with the risk of child maltreatment, after controlling for the effects of child and family factors. However, a comparison of Model 2 (i.e., parent factor only model) and Model 5 (i.e., parent factor plus family factor model) shows that the effect of ethnicity, white versus non-white, is

marginally significant (B= 0.258, S.E. (B) = 0.139, p = .064) when only parent factor variables are integrated. This finding is negated when family factors are also controlled in Model 5 (B= 0.181, S.E. (B) = 0.145, p = .212). This result implies that ethnic minority status as a predictor of child maltreatment is spurious when the family level control variables are incorporated into the model. In order to identify the variable that explained the apparent relationship between being non-white and a higher risk of child maltreatment, each variable in the family factor was sequentially added to Model 2. A closer examination of the potentially spurious effect generated by this procedure reveals that the association, although marginal, between non-white ethnic status and higher risk of child maltreatment is explained away solely by single parenthood status.

Family Factor

The likelihood ratio test result of Model 3, which incorporates only the variables of family factor, shows that the family factors are also significantly associated with the probability of abusing children ($\chi^2(6) = 22.18$, p = .001). Interestingly, however, examination of Model 6 in Table 23, logistic regression model with all of individual/family level factors, shows that none of the family level variables were statistically significant using the conventional alpha level of 5%, after controlling for the effects of individual level factors. Being a single parent is marginally significant and warrants further attention in the model (B= 0.299, S.E. (B) = 0.160, p = .062). However, the estimation result of Model 3, the family level model, suggests that a violent relationship between parental figures (B= 0.175, S.E. (B) = 0.063, p = .005) is another

significant risk factor for child maltreatment in the family factor, before controlling for the effects of individual level risk factors. The B-coefficient of Model 3 compared to Model 5 (B= 0.082, S.E. (B) = 0.069, p = .234) shows a substantial decrease in the effect size of the violent parental relationship variable as a family level risk factor of child maltreatment. This finding suggests that a violent parental relationship is not a separate or independent factor from various individual level characteristics but, possibly, a condition that the parents were forced in as a result of those individual level factors.

A summary of the findings examined in this chapter is provided below. Descriptive statistics show that the overall prevalence rate of any child maltreatment type, based on parents' self report, is 23.8%, physical abuse 8.2%, and neglect 15.3% in this sample.

A preliminary test result of null model suggests, although mixed, that the overall child maltreatment prevalence rate varies across the neighborhood units. This sets the ground for introducing multilevel model in this study. Regarding Research Question 1, the results also show that the neighborhood level prevalence rate of child maltreatment varies across the neighborhood units even after controlling for the individual/family level variables' effects on child maltreatment.

Given the neighborhood level variance of child maltreatment, a number of neighborhood level variables are incorporated into the model. Of the three domains of neighborhood variables (i.e., structural, perceptual, and geographical), only the structual domain significantly, but marginally, improves the overall model fit to the data. The

violent crime rate is the only variable that is significantly associated with neighborhood level prevalence rates of child maltreatment.

Results for Research Question 2 reveal that the effects of two individual/family level variables, having a baby born in low birth weight and having children with developmental difficulties, are not constant across the neighborhood units. Given the significant random effects of slopes, further investigation of cross level interaction shows that neighborhood level average of perceived neighborhood resources alters the effect of having a baby born with low birth weight on child maltreatment. Also, the effect of having children with developmental difficulties significantly interacts with several neighborhood variables, violent crime rate, urbanity, and perceived neighborhood resources.

Findings from Research Question 1 (i.e., examining neighborhood level factors of child maltreatment) and 2 (i.e., examining cross level interaction between individual/family level and neighborhood level variables) are further elaborated in Research Question 3, which compares the multilevel etiological model of child maltreatment for child neglect and physical abuse. A comparison of different types of child maltreatment models reveals that none of the individual/family level variables incorporated in this study are significant in both child neglect and physical abuse models. In the neighborhood level factors, violent crime rate is the only variable that is significant in both types of child maltreatment models. Different variables show significant random effects of slopes for different types of child maltreatment and, consequently, different cross-level interactions are found in different types of maltreatment. Overall, findings

regarding Research Question 3 suggest that different etiological models are needed for child neglect and physical abuse.

Finally, when four neighborhood process models from various disciplines are applied to the context of child maltreatment, the results suggest that only one, institutional community resource model, of these existing neighborhood models is clearly effective in explaining the neighborhood level variance of physical abuse. Among the other models, only the social stress model presents marginal applicability to child maltreatment context.

CHAPTER V

DISCUSSION

The final chapter of the dissertation provides a discussion of the results from the current study. The chapter is divided into six broad sections. The first four sections discuss the research questions for the current study:

Question 1 *Does the child maltreatment rate vary significantly across the neighborhood units after taking the effects of individual and family level risk factors into account? If it does, are neighborhood level variables significantly associated with the neighborhood level variation of the child maltreatment rate?*

Question 2 *Do the effects of individual and family level risk factors of child maltreatment vary significantly across neighborhood units? If they do, which neighborhood level conditions are significantly associated with the variation of the effects of the individual and family level risk factors?*

Question 3 *Is the risk factor model for child neglect different from that of other types of child maltreatment?* and

Question 4 *Among the existing neighborhood process models – social disorganization theory, collective efficacy theory, social stress model, and community institutional resource model – which is most effective in explaining the neighborhood effects on child maltreatment?*

Because the comparison of separate etiological models of child neglect and physical abuse provides deeper insights into findings related to Research Question 1 and 2, a more elaborate discussion is presented in connection to Research Question 3. Following the discussion of the findings related to all four research questions, other significant findings from the individual and family level risk factor models of this study, which emerged from the analysis of the specific research questions of this study, are discussed. The additional findings relate to the child factors that were included in the child maltreatment model and separated from parent and family factors. In addition, findings regarding the intergenerational transmission of child maltreatment are interpreted. The final section of this dissertation addresses the implications of this study to social work practice, policy, and education. Methodological limitations of this study and suggestions for the further research are also discussed.

Research Question 1: Neighborhood effects on child maltreatment rate

Table 24 summarizes the results displayed in Table 6 and 7, which relates to Research Question 1 of this study. The results for the test of model fit improvement by including each domain of neighborhood factors (-2ΔLL) and for each neighborhood level variables (B) in the final model are provided.

These study findings reveal a marginally significant between-neighborhood variance among child maltreatment rates. After controlling for the effects of the individual and family level risk factors of child maltreatment, although not shown in

Table 24, the child maltreatment prevalence rates for overall child maltreatment vary, although marginally, from one neighborhood to another. This result is consistent with findings from previous research on the relationships of neighborhood factors to child maltreatment (Belsky, 1980, 1993b; Deccio et al., 1994; Garbarino, 1977; Garbarino & Sherman, 1980). Furthermore, this finding sets the foundation for further examination of the neighborhood effects in the ecological theory of child maltreatment.

Table 24 Summary of random intercept model

Neighborhood Models	Overall Child Maltreatment
	-2ΔLL
M6 + Structural domain (S)	p < .10
M6 + Perceptual domain (P)	
M6 + Geographical domain (G)	
M6 + S + P + G	
Significant neighborhood variables in the final multilevel model (M0+S+P+G)	
	B
Violent crime rate	p < .05

Further examination of the three neighborhood domains proposed in this study shows that the neighborhood level variance of child maltreatment rates is explained solely by the structural domain of the neighborhood process model. In other words, once the block of variables in the structural domain of the neighborhood model was added to the individual and family level model of child maltreatment, the remaining unexplained random variance of prevalence rates in the neighborhood level turned statistically non-

significant.

However, the findings should be interpreted with caution because the initial random variance component was relatively minimal and only marginally significant. In essence, even a slight association between the structural domain of neighborhood factors and the neighborhood level prevalence rates of child maltreatment could explain away the random variance of the child maltreatment rate.

In examining each neighborhood variable included in this study, of those risk factors included in the structural domain of this study, only the violent crime rate is significantly and positively associated with the overall child maltreatment rates in the neighborhoods. Further examination of neighborhood level variables reveals some discrepancies between these results and those of other studies. For example, this study shows that the proportion of single households and, although measured differently, average socioeconomic status are not associated with neighborhood level prevalence rates of child maltreatment. This finding is different from the results reported by Drake and Pandey (1996).

To better understand the inconsistencies between this study and the previous research, the methodological differences between this study and others should be acknowledged. Most notably, the outcome variables for child maltreatment used in this study were different from the previous study. For example, this study utilized the self-reports of child neglect and physical abuse. Given the nature of self-reports, it is possible that a social desirability bias provided underestimate of the rate of child maltreatment in this investigation. Drake and Pandey's study (1996), however, utilized Child Protective

Services (CPS) data to measure child maltreatment which is known to be vulnerable to "maltreatment report bias" (D. D. Perkins & R. B. Taylor, 1996) by overestimating the true prevalence rate of child maltreatment in high risk neighborhoods.

While the social desirability bias underestimates the true prevalence equally, for example, in both low and high SES neighborhoods, the "maltreatment report bias" overestimates the true prevalence rates of maltreatment differently depending on the neighborhood conditions. Specifically, the number of child maltreatment reports to CPS from low SES neighborhoods were likely to be unevenly overestimated because they were more subject to being investigated by the agencies (Ards, Chung, & Myers, 1998; Ards & Harrell, 1993). Weighing these two different sources of biases together, the estimation of the effect size of the association between neighborhood poverty and the prevalence rate of child maltreatment is likely to be larger in a study measuring child maltreatment using officially documented information than in a study using self-reports.

In summary, the results of this study confirm the hypothesis that child maltreatment rates vary across the neighborhood units after controlling for the effects of individual and family level effects. More importantly, however, the proposed neighborhood model using three domains of neighborhood measurement presented only limited capability in explaining the existing variance of child maltreatment across the neighborhoods. Given that the results stand in contrast to previous studies, special efforts should be made to utilize other sources of information such as children's medical records, observations, and/or school records to triangulate and create more valid and consistent child maltreatment measures.

Research Question 2: Random slope effects of individual and family level risk factors

The results from Tables 8, 9, and 10 are further summarized in Table 25. Table 25 summarizes the findings of the random slope effects (τ_{11}) and cross level interaction effects. Only those variables with significant random slope effects and the cross level interaction effects are presented in the Table 25.

Table 25 Summary of random effects multilevel child maltreatment models

Random Slopes	Significant Cross Level Interactions			
	(Individual level)	X	(Neighborhood level)	
Low birth weight	p < .05			
	(Low birth weight)	X	(Perceived neighborhood resources)	p < .10
Developmental difficulties	p < .10			
	(Developmental difficulties)	X	(Violent crime rate)	p < .10
	(Developmental difficulties)	X	(Urbanity)	p < .05
	(Developmental difficulties)	X	(Perceived neighborhood resources)	p < .10

The results of this study reveal that there are some individual and family level risk factors of child maltreatment for which slopes randomly vary across neighborhoods. This study found that the effects of having a baby born with low birth weight and having a child with developmental difficulties on child maltreatment are not constant across neighborhood units. These findings indicate the need for the further research that more closely examines neighborhood effects on child maltreatment. Since we found that there was unexplained variance among those risk factors to specific types of child maltreatment,

models, using various neighborhood characteristics to explain the variance of random effects, could be created.

The results of this study show that several neighborhood factors are significantly associated with the random variance of the effects of those individual and family level risk factors. More specifically, perceived neighborhood resources are associated with the variance of those slopes of having children born with low birth weight and also with that of having children with developmental difficulties. The level of urbanity and violent crime rates of the neighborhood units were also associated with the variance of the slopes of having children with developmental difficulties in the overall child maltreatment model.

Those neighborhood effects on the random variances of the effects, or slopes, of the individual and family level factors could be viewed as an interaction effect, or moderator effect, between those variables. Those interaction effects between the lower level, or individual and family level, variables and higher level, or neighborhood, variables were referred to as cross level interaction (Raudenbush & Bryk, 2002) or macro-micro-interaction in the multilevel model literature (Snijders & Bosker, 1999). In essence, the existence of significant cross level interaction indicates that the relationship between the individual and family level variables and the risk of child maltreatment is dependent on the neighborhood level variables.

For example, the relationship between having a child with developmental difficulties and the parents' risk of abusing their children is dependent on whether they reside in urban or rural neighborhood. Stated differently, parents who have children with

developmental difficulties are less likely to abuse their children if they live in a urban versus rural area as there is a negative cross level interaction between having children with developmental difficulties and neighborhood level urbanity.

Research Question 3: Different Models for Different Type of Child Maltreatment

As previously mentioned, this section further explores the findings from Research Question 1 and 2 as they relate to Research Question 3. Consequently, this section further elaborate the findings that could have been discussed in the previous sections of Research Questions 1 and 2. This is done to more logically connect the comparison of ecological models to the three research questions.

Although the overall proportion of studies that fail to address the differences in the models between different types of abuse has been decreasing in the child maltreatment literature (Behl et al., 2003), a large part of the literature on child maltreatment still ignores the effects of the different types of child maltreatment in the overall study design (Heller et al., 1999). The Panel on Research on Child Abuse and Neglect of the National Research Council highlighted the need for studies to address similarities and differences in the etiology of abuse by type of maltreatment (National Research Council, 1993).

The results of this dissertation support the recommendation of the National Research Council and provides evidence suggesting that distinct child maltreatment risk factor models are needed for the different types of child maltreatment. However, this study could not provide statistical evidence that building type specific models for child

maltreatment fit better to the data than one model for overall child maltreatment model.

Table 26 further summarizes the results shown in Tables 11 through 15 in order to highlight the different patterns among significant risk factors for neglect and physical abuse. Those variables that were not significant in any type of maltreatment models are excluded from the Table 26.

Table 26 Significant risk factors for different type of maltreatment

Significant Risk Factors		Physical Abuse	Neglect
Individual Level			
Child	Low birth weight		$p < .05$
	Irritability	$p < .05$	
	Health	$p < .05$	
	Developmental difficulties	$p < .10$	$p < .05$
Parent	Education		$p < .10$
	Gender		$p < .05$
	Age being parent	$p < .05$	
	Drug abuse	$p < .05$	
	Depression		$p < .05$
	Cyclically employed	$p < .05$	
	Neglected as a child		$p < .05$
	Physically abused as child	$p < .05$	
Family	Number of children	$p < .10$	
	Single parent	$p < .10$	
Neighborhood Level			
Neighborhood	SES		$p < .05$
	Violent crime rate	$p < .10$	$p < .05$
	Region: South	$p < .05$	

First of all, the results of this study show that the significant risk factors for

different types of abuse stem from different levels of the human ecological system. In other words, after controlling for the effects of individual level risk factors, there were no neighborhood level risk factors of physical abuse that were significant either as separate variables or as a group of variables in the neighborhood model of this study. The only variable that was significant at the neighborhood level in the physical maltreatment model was the regional location of the neighborhood (i.e., Southern area with Eastern area as reference), which is related with more macro level characteristics than the neighborhood unit characteristics utilized in this study. However, a few family level factors such as number of children in a household and single parent status were indeed significant, although only marginally associated with the parents' risk of physically abusing their children. This finding is consistent with other studies that identify single parenthood as risk factor for child physical abuse (Caplan, Watters, White, Parry, & Bates, 1984; Zuravin, 1988).

On the other hand, none of the family level risk factors in the child neglect model were significant risk factors, after controlling for the effects of individual level risk factors. In the neighborhood model of child neglect, unlike the physical abuse model, the prevalence rates of child neglect in neighborhoods with low socioeconomic status or the high violent crime rates were significantly higher than other neighborhood units that did not have such characteristics. Taking these findings collectively into consideration, the data suggests that the family system plays a more critical role in child physical abuse than in child neglect. It also suggests that the neighborhood system is more important than the family system in a child neglect context. These findings are consistent with previous

research on adolescent maltreatment, which shows that neglect was primarily associated with extra-familial difficulties and social isolation while physical abuse was linked more with familial or individual factors (Williamson, Bordium, & Howe, 1991).

Next, as indicated by the significance of "neglected as child" and "physically abused as child" in the child neglect and physical abuse models, respectively, this study found that the patterns of intergenerational transmission of abuse are also different depending on the type of maltreatment. More explicitly, child physical abuse is transmitted to the next generation by increasing the risk of victims' abusing their own children in the same type, physical abuse not neglect. Child neglect also exposes victims to the increased risk of neglecting their children, but not increase their risk of physical abuse. Social learning theory of child maltreatment may help explicate this phenomenon (Simons, Whitbeck, Conger, & Wu, 1991). In other words, parents who either physically abuse or neglect their children may do so because they experienced that specific type of maltreatment as children. Similarly, since social learning theory asserts that behavior is learned through observation and imitation of the behavior of those around an individual (Bandura, 1977), it is more likely for parents to commit the same type of maltreatment that they experienced as children as opposed to do other forms of maltreatment.

One of the most significant findings related to this research question is that, when comparing the risk factors that were significant at 5% of alpha level in the multilevel logistic regression models for each type of child maltreatment, none of the significant risk factors in the physical abuse model were also significant in the child neglect model. Conversely, none of the significant risk factors in the neglect model were

significant in the physical abuse model. In sum, risk factors that are significantly associated with one type of child maltreatment are not important predictors of other forms of child maltreatment.

These findings imply that the explanatory power of child maltreatment research is limited unless the differences in etiological models of child physical abuse and that of neglect are taken into account. Also, the findings from this study suggests the need for further validation studies of previous child maltreatment research using different models tailored to different types of child maltreatment.

Furthermore, this study makes a noble contribution to the child maltreatment literature by revealing the neighborhood level risk factors of child maltreatment that are associated with specific types of child maltreatment. Unlike previous studies of this kind (e.g., Drake & Pandey, 1996), this study examines the relationship between the ensemble of neighborhood level factors and specific types of child maltreatment, after taking the effects of individual and family level risk factors into account.

The results of this study related to neighborhood effects on child maltreatment provide some mixed findings when compared with previous studies supporting the significant association between child maltreatment, both physical abuse and neglect, and such neighborhood factors as poverty rate, average socioeconomic status, and proportion of single households (Drake & Pandey, 1996). As shown in the Table 15 of neighborhood level variables' estimates, the average socioeconomic status in a neighborhood was negatively associated with the prevalence rate of child neglect, but not with that of physical abuse. This result is consistent with the findings from Drake and Pandey (1996)

showing that there are positive associations between neighborhood poverty and the prevalence rate of different types of child maltreatment. Moreover, child neglect is most strongly associated with neighborhood poverty.

However, the results of this study depart from the previous study in that socioeconomic status, as a neighborhood condition, was associated only with the prevalence rate of child neglect, but not with child physical abuse. It also differs from previous studies suggesting that the proportion of single headed families in a neighborhood is a neighborhood level risk factor of prevalence of child maltreatment (Drake & Pandey, 1996; Garbarino & Crouter, 1978), as the proportion of single headed households is not significantly associated with the prevalence rate of any type of child maltreatment in this study.

Table 27 summarizes the comparison results of the random variance of slopes by maltreatment types. Again, different variables for different types of maltreatment have significant variance of random slopes. In other words, the effect of violent relationships with partners in the physical abuse model is not same for all different neighborhoods included in the study. The random variance of those effects, or slopes, of the number of children in a households in physical abuse model and having unwanted babies in neglect model are marginally significant.

When examining the results summarized in Table 27, it should be noted that all the randomly varying effects in the child physical abuse model are concentrated in the family level factors, whereas the random varying effects are at the individual and parent

level factors for the neglect model. This finding suggests that neighborhood factors are likely to be associated with the family level risk factors for child physical abuse and the parents level risk factors for neglect.

Table 27 Summary of random effects multilevel child maltreatment models

Type of abuse	Significant Cross Level Interactions			
	(Individual level)	X	(Neighborhood level)	
Physical Abuse				
	(Number of children)†	X	(Violent crime rate)	p < .10
	(Number of children)†	X	(Proportion of at risk children)	p < .05
	(Violent partner relationship)*	X	(Housing quality)	p < .05
	(Violent partner relationship)*	X	(Perceived safety)	p < .10
Neglect				
	(Having unwanted baby)†	X	(Mobility)	p < .10
	(Having unwanted baby)†	X	(Average SES)	p < .05
	(Having unwanted baby)†	X	(Perceived network)	p < .05

Another notable finding is that some of the variables with significant variance of random effects in the multilevel model of child maltreatment are not significant in the original model without the random slope effects associated. More specifically, the respondents' violent relationships with their partners, which presented the random slope variance in the physical abuse model, was not a significant risk factor for physical abuse in the original model shown in Table 13 (i.e., comparing family factors by maltreatment types). This finding suggests that those variables do not affect the parents' risk of abusing their children when, and only when, an average effect across all the neighborhoods was used. However, the significant variance of those variable having "zero" slope on the

average indicates that the effects of those variables were actually non-zero, or significant, in some neighborhood units, depending on yet unknown neighborhood conditions. As Hox (2002) noted, "it is quite possible for an explanatory variable to have no significant average regression slope, but to have a significant variance component for this slope (p. 52)" in multilevel models. The research question 2-2 originated from this inquiry and attempted to identify those neighborhood conditions that made the differences on the effects of those variables.

In the physical child abuse model, two neighborhood conditions, a violent crime rate and a proportion of at risk children in a neighborhood were associated with the randomly varying effects of the number of children in the household. Also, housing quality and perceived safety in the neighborhood units were associated with the randomly varying effects of domestic violence on the risk of physical abuse. In the child neglect model, residents' mobility, average socioeconomic status, and perceived neighborhood network explain the random variance of the slopes between having an unwanted baby and the risk of child neglect.

As we did in the previous discussion of Research Question 2, those neighborhood effects on the random variances of the effects, or slopes, of the individual and family level factors could be stated as an interaction effect, or moderator effect, between those variables, namely cross-level interaction (Raudenbush & Bryk, 2002). Stated differently, on average across the neighborhood units, there is a negative relationship between the number of children and parents' risk of abusing their children. This is contrary to previous research findings (Chaffin et al., 1996). However, the

significant interaction effect between the number of children and the proportion of at risk children alters the direct effect of the number of children to the risk of abuse. Moreover, the slope representing the relationship between the two variables became smaller as the proportion of at risk children increases. Since the total effect of the number of children to the risk of abuse is a sum of the direct effect and the interaction effect (B = 0.309), the direct effect of number of children to the risk of child physical abuse (B = -0.358; odd ratio = 0.699) should be interpreted with caution, given this applies only when residing in a neighborhood with no at risk children (i.e., zero percent). However, if they live in a neighborhood where the proportion of at risk children is as high as, for example, .247[22], the effect size (B = -0.282; odd ratio = 0.755) is much smaller than the original value.

The findings from this study imply that there are some neighborhood characteristics that function as protective factors for those who were at high risk for maltreating their children. For example, the effects of having a baby with developmental difficulties to the risk of overall child maltreatment, as discussed with Research Question 1, is much lower when the parents live in an urban area than when they reside in rather rural area. Higher levels of perceived neighborhood networks and average neighborhood socioeconomic status are also protective factors for those parents who had unwanted babies in the child neglect model. These findings support the importance of including compensatory factors, as opposed to potentiating factors, in the etiological model of child maltreatment within ecological theory (Cicchetti & Lynch, 1993; Cicchetti & Toth, 1995).

[22] It is the highest value in the distribution of the proportion of at risk children in the Add Health study data set.

Research Question 4: Searching for the best neighborhood process models for child maltreatment

The findings for Research Question 4 of this study are illustrated in Tables 18 through 21 and are further summarized in Table 28. Table 28 displays the significance of the likelihood ratio test (-2ΔLL) for four different neighborhood process models and shows whether there is significant improvement in the overall model fit for different types of child maltreatment. Furthermore, the significant neighborhood level variables that comprise each neighborhood process model are also presented in Table 28.

Table 28 Summary of findings from Research Question 4

Neighborhood process model	Physical Abuse	Neglect
Social Disorganization		
Housing quality		*p < .10*
Collective efficacy		
(None)		
Social stress		p < .10
Overall crime rate		*p < .10*
Institutional community resource	p < .05	
% state expenditure to housing & environment	*p < .05*	

Note: Italicized p-values are results of Wald test for independent variables

The results of this analysis suggest that none of the tested neighborhood process models – social disorganization theory, collective efficacy theory, social stress model, and institutional community resource model – are useful in explaining the neighborhood level

random variance of the child neglect prevalence rate at 5% of alpha level. After relaxing the alpha level to 10%, only the social stress model explains the neighborhood level variance of the child neglect prevalence rate.

On the other hand, the institutional community resource model of the neighborhood process proved to be useful in understanding differences in the rate of child physical abuse across the neighborhood units. Also, the social stress model, which marginally improved the model fit to the data in the child neglect model, does not prove to be useful in the physical abuse model.

Findings from this study regarding the capability of the social stress model are contrary to previous research findings. While prior studies have found that stress enhanced the potential for violent acts specifically related to child abuse (Herrenkohl, Herrenkohl, & Eglof, 1983; Schellenbach, Monroe, & Merluzzi, 1991), this study suggests that social stress is more related to the neighborhood level prevalence rate of child neglect than to that of child physical abuse.

On the other hand, while social stress model and institutional community resource model improve the overall model fit for child neglect and child physical abuse models, respectively, the random variances of the intercept were still significant after the effects of the neighborhood process models were taken into account. This implies that the social stress model does not completely account for the neighborhood level variance of the prevalence rates of those types of child maltreatment. Consequently, even after the social stress model explained the neighborhood level variance of the overall child maltreatment prevalence rate, unexplained variance in neighborhood level prevalence of

child maltreatment remains.

However, the limited availability of the measurement model for each neighborhood process model prevented making any decisive conclusions regarding the capacity of those neighborhood models to explain neighborhood level differences among child maltreatment prevalence rates. Those indicators of informal neighborhood mechanisms such as monitoring of spontaneous play groups among children, reducing truancy, drinking, vandalism, or a willingness to intervene to prevent public space disturbance (e.g., graffiti, fighting, loitering) (Sampson et al., 1997) were the key variables in the collective efficacy model, but none of these variables were readily available in this study. Consequently, findings from this study should be interpreted with caution. Further research using more relevant and comprehensive measurement models of these theories is warranted.

Findings from Individual Level Variables

Findings from child factor

Table 29 summarizes the findings for the effects of the child factors in each model of child maltreatment. The interpretation of significant contributions of child factors must be done with caution because the causal direction of the significant association between the child characteristics such as irritability, health status, and developmental difficulty or delay and parents' risk of committing abusive behaviors cannot be clearly identified from the results of this study. For example, the high irritability among those abused children may be a result, rather than cause, of the fact that

they had been abused. It is plausible that the children abused by their parents were more irritable as a result of the abuse than those who were not and equally likely that those who were irritable were more likely to be abused by their parents.

Table 29 Significant risk factors in child level

Significant Risk Factors	Physical abuse	Neglect
Low birth weight		$p < .05$
Irritability	$p < .05$	
Health	$p < .05$	
Developmental difficulties	$p < .10$	$p < .05$

Related to the design of this study, it should be noted that those children with characteristics normally considered to be risk factors, were not necessarily more likely to be abused. Given that the outcome variables for child maltreatment in this study were collected only from parents, and not linked to specific children, it is not clear which children were abused by the parents in households with more than one child.

As stated previously, low birth weight, or prematurity, and developmental difficulties or delay were positively associated with parents' risk of neglecting their children while not associated with that of physical abuse. However, it is not appropriate to assume that a child born with low birth weight and who manifests behavioral difficulties is more likely to be neglected by his/her parents because only perpetrators, not victims, were identified in this study. Nevertheless, the direction of associations between the risk factors and parents' risk of maltreating their children conformed to the findings

from existing literature (Sidebotham et al., 2003).

However, findings of this study show that the previously identified association between child maltreatment and child level risk factors such as low birth weight and developmental difficulties were valid only for the child neglect model but not for the physical abuse model. This finding can be better understood to mean that those children who are less attractive or less stimulating may be more likely to fail in obtaining their caregivers' attention, which in turn leads to increased risk of neglect, but not necessarily to physical abuse. The positive association between children's developmental difficulties and parents' risk of child neglect can also be understood in light of the relationship between children's disabilities as a risk factor for being maltreated. As documented in previous literature (Sidebotham et al., 2003; Sullivan & Knutson, 2000), disabled children are especially vulnerable to maltreatment. Although it does not directly measure the manifested disability, the measure of developmental difficulties and delay includes some indicators of disabilities such as "any physical, emotional, or mental condition that limits or interferes with their ability to learn (h3kk9)" and "condition that keeps them from the activities other children their age do routinely (h3kk10)."

Findings from this study regarding children's irritabilities or behavior problems in the context of child maltreatment concur with previous studies (David A. Wolfe & Mosk, 1983). Furthermore, the fact that irritability was not a significant risk factor for neglect, while it was for physical abuse suggests that the occurrence of physical abuse is better understood in the context of child-parent interaction than child neglect.

Children's better health in this study appears as a significant risk factor for

physical abuse and is not associated with that of neglect. Interestingly, the direction of association between children's health and the risk of maltreatment in this study is contrary to findings from previous literature (Sidebotham et al., 2003). One possible explanation for that difference can be found in the different methods for operationalizing child's health. In Sidebotham et al.'s study (2003), for example, poor health status was operationalized by asking whether the child was ever admitted to the hospital in the first 30 months of life, which indicates that their study tapped into rather serious health problems. In the Add Health study, however, child health was measured by asking the parent to choose one category that best described their child's health from five categories: excellent, very good, good, fair, and poor. Given that only one category measured the poor health status whereas four other categories ranged from excellent to fair, the child's health scale used in the Add Health study was skewed in terms of positive health status. The Add Health study, therefore, captured more variability on the positive side of health status distribution (i.e., fair to excellent) than other studies did. Assuming the association between child's health status and the parents' risk of committing physical abuse were real in the population and did not emerge from any artifacts, the different direction of association between the findings of this study and other studies (e.g., Sidebotham et al., 2003) suggests a curve-linear nature of the relationship. In other words, parents' risk of physically abusing their children decreases if their children's health status is better to the extent that they do not need to be admitted to a hospital. However, the risk increases again as the children's health status goes from "fair" to "excellent." Nevertheless, the process of explaining how children with better health status are more likely to be abused

is not clear and warrants further research with more comprehensive measures of child health status.

Intergenerational Transmission of Abuse

The only variable that appears to explain the original relationship between the violent parental relationship and the increased risk of child maltreatment is the parents' childhood history of physical abuse. This examination of the spurious relationship between the parental violent relationship and child maltreatment suggests that those who were physically abused in their childhood are more likely to have a violent partner relationships as adults. In turn, this violent relationship between parental figures operates as a family level risk factor for abusing their own children. The hypothesis that there is a spurious relationship can be further tested using a path analysis.

Findings regarding the hypothesis of intergenerational transmission of child maltreatment are further summarized in Table 30. Numbers in each cell show the odd ratio between those who were abused as children and those who were not. The empty cells indicate the non-significant odd ratio.

Table 30 Summary findings related to the intergenerational transmission of abuse

	Odd Ratio		
	Any abuse	Physical abuse	Neglect
Neglected as children	1.96		2.97
Physically abused as children	1.62	5.29	

Findings from this study not only confirm the hypothesis of the intergenerational transmission of child maltreatment, but also suggest that only the same type of maltreatment is transmitted to the next generation. In sum, the child maltreatment models separately estimate, by type of abuse, show that there is a "type specific" pattern of intergenerational child maltreatment. Furthermore, the examination of the intergenerational child maltreatment factors across the child maltreatment models reveals that the effect size of the intergenerational child maltreatment in the previous research might have been underestimated, unless they were examining the phenomena in a "type specific" manner.

More specifically, as shown in Table 30, the effect sizes of being neglected and physically abused as children in the overall child maltreatment model measured using odd ratio are 1.96 and 1.62, respectively. However, the odd ratio between those who were neglected in their childhood and those who were not in the child neglect model is 2.97, about one and a half times larger than that in the overall model. Moreover, the same effect size of being physically abused as children in the physical abuse model is 5.30, which is more than three times larger than the same estimation in the overall child maltreatment model. These findings imply that the estimated intergenerational transmission rate of child maltreatment in the existing studies was potentially underestimated unless they examined the transmission rate after dividing the cases by specific type of child maltreatment.

In spite of the findings regarding intergenerational transmission of child abuse, it should be noticed that majority of parents having been abused as children broke the cycle

of abuse and did not abuse their children. In fact, more than two thirds of the parents (67.9%) who were abused by their parents did not abuse their children at all.

Discussion of Effect Size in Multilevel Model

Given the answers to Research Question 1 (i.e., whether or not the neighborhood domains improve the overall model fit), it would be beneficial to know how effective those domains are in explaining the neighborhood level variance of child maltreatment. This inquiry leads to the question about the effect size of this multilevel model study.

One way to answer this question is to calculate, for example, multiple regression coefficient, R^2, or variance explained by the neighborhood domain variables. Since there is more than one variance component in multilevel model, this approach results in a few R^2 measures, one per variance component. R^2 measure for individual level variance explained by the model, R_{ind}^2, in multilevel logistic regression, is technically complicated, if not impossible, because the individual level, or level-1, variance in logistic regression has a fixed value, $\pi^2/3 = 3.29$ (Snijders & Bosker, 1999). Further discussion about the level-1 variance explained by the model, R_{ind}^2, is not provided here because it is outside the primary concerns of this study.

However, the proportion of neighborhood level variance explained by neighborhood model of this study, R_{neigh}^2, can be calculated even in the multilevel logistic regression model using conventional concept of proportional reduction of error, or unexplained variance (Hox, 2002; Snijders & Bosker, 1999). Table 31 summarizes the unexplained neighborhood level variance for each of proposed neighborhood level

domains and corresponding R_{neigh}^2.

Table 31 Neighborhood level variance (τ_{00}^2) explained by the model and R_{neigh}^2

Neighborhood Models	Overall Child Maltreatment	
	τ_{00}^2	R_{neigh}^2
Individual & family level model (M6)	0.224	
M6 + Structural domain (S)	0.189	.16
M6 + Perceptual domain (P)	0.222	.01
M6 + Geographical domain (G)	0.234	-.04
M6 + S + P + G	0.202	.10

The results show that about 16% of neighborhood level variance is explained when the structural domain of neighborhood effects are incorporated into the model. Interestingly, further examination of Table 31 reveals that the incorporation of geographical domain results in a negative R^2 value, -.04 or 4% increase of variance, which is undesirable and counter-intuitive. However, it is not surprising and quite often the case in multilevel models because these measures depend on the distribution of the explanatory variables as well as on the explanatory power of variables in the model (Snijders & Bosker, 1999).

In this regard, it is recommended "not setting too much store by the calculation of an R^2_B or R^2_W (p. 119, Kreft & Leeuw, 1998)" because "Both concepts are ill defined and ambiguous, while their usefulness is limited to random intercept models (p. 119, Kreft & Leeuw, 1998)."

Conclusions: Implications, Limitations, and Recommendations

Several points need to be stressed in relationship to the findings of this study. This section is comprised of three parts: social work implications, limitations, and recommendations for further research.

Social Work implications

The findings of this dissertation study have several implications for Social Work. First, the results of this study highlight the importance of considering various neighborhood conditions when child welfare practitioners and policy makers address child welfare issues. More explicitly, the neighborhood conditions that can be readily measured such as crime rates, urbanity, regional location, and/or neighborhood socioeconomic status are not the only neighborhood conditions that affect the etiology of child maltreatment. Other conditions that should be taken into consideration can be determined only by probing the neighborhood residents' perception of safety, community networks, and happiness. Although more challenging in terms of accessing data, these neighborhood factors are critical in explaining the occurrence of various types of child maltreatment. This finding suggests that the community child welfare practitioners should make special efforts to detect and understand how the community residents are feeling about their neighborhood to better prevent child maltreatment.

Second, this study proposes that both practice and policy efforts to prevent child maltreatment must be tailored to each type of maltreatment. The findings of this study

show that the risk factors for child maltreatment have different patterns at every level of human ecology, depending on the type of maltreatment. Given the finding that there were no variables that were significant risk factors in both models of physical abuse and neglect, the "one-fits-all" approach is not necessarily effective in the prevention of child maltreatment.

Lastly, in terms of the policy level social work, the findings from this study prompt immediate attention in terms of enhancing such neighborhood conditions that function as protective factors in the human ecology of child maltreatment. Although the exact process of those relationships is not completely explained by this study, several neighborhood factors such as perceived neighborhood networks and safety play protective roles for those who were exposed to certain individual and family level risk factors of child maltreatment. This finding suggests that policy makers, as well as community social work practitioners, need to increase efforts in building solid community networks among residents. It further guides child maltreatment prevention specialists to collaborate with other fields such as criminal justice, community psychology, and education, to better secure safe living environments.

Limitations

There were a few methodological limitations that should be addressed in interpreting the study findings. First, the results of this study should not be viewed as nationally representative. Although the Add Health study was designed to represent early adults between the ages of 18-24, in the U.S. at the time of Wave III, the present study

did not perform the necessary statistical adjustments that could have made the study results nationally representative. The decision not to employ the statistical adjustments was partly due to the limited resources available for this dissertation study. Statistical software packages that could help build a multilevel logistic regression model that would simultaneously allow this study to correct the "design effect" of the original study were sought for. In the absence of the most appropriate software, the decision was made to utilize *xtlogit* (StataCorp, 2003b) and *gllamm* (Rabe-Hesketh et al., 2000) modules available in Stata (StataCorp, 2003a) to estimate the random effects of multilevel logistic regression models. Unfortunately, those modules of Stata were either not able to associate the probability weights of the original Add Health study or were computationally too demanding to incorporate the probability weights into the estimation.

A second limitation of this study relates to the selection of optimal neighborhood units. The census block groups were utilized as the neighborhood units in this study, and were also utilized in other neighborhood research (Coulton et al., 1996; Taylor et al., 1984). Block groups are the smallest census unit for that the aggregated measure of census data are provided. The census block group was used because it was considered to best fit the actual neighborhood unit. The school unit, used in the original Add Health study, could have been utilized as a level 2 unit of analysis to represent the neighborhood units for this study. However, although there was some overlap between the neighborhood conditions within the school boundary and census block groups, drawing the neighborhood boundary using the school unit was considered too big to represent the optimal neighborhood units for this study.

The third and most critical limitation is the lack of the neighborhood level data set for the Wave III. Although many efforts have been made to obtain the Wave III contextual data set from the Add Health study, limited resources made setting up the complete contextual data set prohibitive. Consequently, this study utilized the contextual data measured in their adolescent age as proxy measures for their current neighborhood condition. In other words, a lagged specification of neighborhood effects was used instead of current neighborhood. This proxy measurement for neighborhood is conventionally used in the adolescent development literature (Brooks-Gunn et al., 1993; Wheaton & Clarke, 2003). Since this study utilized the neighborhood contextual data for the study participants' adolescent age instead of current contextual data, the findings and conclusions from this study regarding the neighborhood effects on the risk of child maltreatment should be interpreted with caution. More specifically, the findings from this study regarding neighborhood effects reflect the relationship between the risk of child maltreatment and the various characteristics of the neighborhood where the parents resided during their adolescence. Thus, the findings of this study showing the significant neighborhood effects on the risk of child maltreatment can be understood in light of previous research findings on the lagged effect of childhood neighborhood socioeconomic disadvantage on early adult mental health (Wheaton & Clarke, 2003).

The last limitation of this study relates to the age specific population of the Add Health study. As mentioned earlier, the Add Health study sampled those adolescents in grades 7 through 12 between 1994 and 1995. The ages within the study sample ranged from 18 to 27, which is a comparatively your sample of parents. Also, over 90% of the

children of the young parents were under age 7 and half of them were under 12 months. On balance, therefore, the multilevel child maltreatment etiological model examined in this study represents the risk of child maltreatment for relatively younger parents.

Recommendations for further research

This dissertation study concludes with a few recommendations for further research. First, since this study utilized the lagged specification of neighborhood factors and reveals evidence of neighborhood effects on the risk of child maltreatment, further studies that examine current neighborhood factors are warranted. A study using the more current neighborhood contextual data should be able to validate the findings from this study and, in addition, test which neighborhood measures should be used in the child maltreatment model. Furthermore, since it is expected that current neighborhood conditions are related to previous neighborhood conditions, more sophisticated designs that can appropriately separate the effect of current neighborhood conditions from that of the previous neighborhood conditions should be explored and conducted. For example, the "temporal-contextual perspective" suggested by Wheaton and Clarke (2003) merits a special consideration in this regard.

Second, further studies might consider neighborhood based, as opposed to school based, studies of child maltreatment that incorporate various neighborhood units into the study design. The primary purpose of these studies is to find the most appropriate neighborhood units for child maltreatment research. Since child maltreatment occurs in a neighborhood context, studies dovetailed to test the best neighborhood unit would

strengthen child maltreatment research.

Third, since the results highlight the importance and effectiveness of including child factors separate from the parent factors when examining the individual level risk factors of child maltreatment, further child maltreatment research should make special efforts to properly address the child factors in the study design. The findings from this study regarding the effects of child factors were only suggestive because the primary unit of analysis in this study was the parent and corresponding household. In other words, even if there were more than one child in a household, this study could not identify which child was the victim of the maltreatment. As the reader may recall, this limitation stemmed from the Add Health study, in which parents were asked whether they ever maltreated their children but did not ask which specific child was maltreated. This study could have been improved if the original study identified the victim child and collected the characteristics of the child. This would have allowed each individual child to be treated as a separate level of analysis and nested into the family or household. The separation of child as an independent unit of analysis enables testing whether family level random effects exist in the child maltreatment. This sibling model of family level factors for risk of child maltreatment could incorporate the random effect to account for the unmeasured family level characteristics shared by children within the same family (Powers, 2001).

The final recommendation is related to the measurement of the outcome variable for this study. As briefly discussed, further research in this field should triangulate the measures of child maltreatment from multiple sources. Considering the possible bias

related to measurement of child maltreatment, the comparison of multiple sources of information should be one of the most critical research agendas in child maltreatment research.

Summary

This study found that separate risk factor models are required for different types of child maltreatment. In this multilevel study of child maltreatment, results show that the prevalence rate of child maltreatment varies significantly across the neighborhood units, after controlling for the effects of individual and family level risk factors. This significant variance of neighborhood level prevalence rates existed in the type-specific model of child physical abuse and neglect. Neighborhood characteristics such as average neighborhood socioeconomic status, violent crime rate, and regional location are significantly associated with the neighborhood level prevalence rates of child maltreatment, after taking the effect of individual and family level risk factors into account. This study also found that the neighborhood effects in the multilevel child maltreatment models moderate the effects of individual and family level factors.

On the other hand, this study found that various child characteristics in the multilevel model of child maltreatment significantly contribute to parents' overall risk of physically abusing or neglecting their children, over and above the risk associated with parent and family level factors. Separate models for physical child abuse and child neglect that were tested and compared, indicate that there are distinctive etiological models for different types of maltreatment.

Four neighborhood process models were applied to child maltreatment context. This study found that only two, institutional community resource and social stress model, of the four process models are somewhat effective in explaining neighborhood level prevalence rate of child abuse.

REFERENCES

Ards, S., Chung, C., & Myers, S. (1998). The effects of sample selection bias on racial differences in child abuse reporting. *Child Abuse & Neglect, 22*, 103-116.

Ards, S., & Harrell, A. (1993). Reporting of child maltreatment. A secondary analysis of the National Incidence Surveys. *Child Abuse & Neglect, 17*, 337-344.

Azar, S. T. (1991). Models of child abuse: A metatheoretical analysis. *Criminal Justice and Behavior, 18*, 30-46.

Azar, S. T., Povilaitis, T. Y., Lauretti, A. F., & Pouquette, C. L. (1998). The current status of etiological theories of intrafamilial child maltreatment. In J. R. Lutzker (Ed.), *Handbook of child abuse research and treatment* (pp. 3-30). New York: Plenum.

Azar, S. T., Robinson, D. R., Hekimian, E., & Twentyman, C. T. (1984). Unrealistic expectations and problem solving ability in maltreating and comparison mothers. *Journal of Consulting and Clinical Psychology, 52*, 687-691.

Bandura, A. (1977). *Social learning theory*. New Jersey: Prentice-Hall.

Barnett, O. W., Miller-Perrin, C. L., & Perrin, R. D. (1997). *Family violence across the lifespan: An introduction*. Thousand Oaks, CA: Sage.

Barry, F. (1994). A neighborhood-based approach: What is it? In G. Melton & F. Barry (Eds.), *Protecting children from abuse and neglect: Foundations for a new national strategy* (pp. 14-39). New York: Guilford.

Behl, L. E., Conyngham, H. A., & May, P. F. (2003). Trends in child maltreatment literature. *Child Abuse & Neglect, 27*, 215-229.

Belsky, J. (1980). Child maltreatment: An ecological integration. *American Psychologist, 35*, 320-335.

Belsky, J. (1993a). Etiology of child maltreatment: A developmental-ecological analysis. *Psychological Bulletin, 114*(3), 413-434.

Belsky, J. (1993b). Etiology of child maltreatment: A developmental-ecological analysis. *Psychological Bulletin, 114*(3), 413-434.

Black, D. A., Heyman, R. E., & Slep, A. M. S. (2001). Risk factors for child physical abuse. *Aggression and Violence Behavior, 6*, 121-188.

Bronfenbrenner, U. (1977). Toward the experimental ecology of human development. *American Psychologist, 32*, 513-531.

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge, MA: Harvard University Press.

Brooks-Gunn, J., Duncan, G. J., Klebanov, P. K., & Sealand, N. (1993). Do neighborhoods influence child and adolescent development? *American Journal of Sociology, 99*, 353-395.

Buchanan, A. (1996). *Cycles of child maltreatment : facts, fallacies, and interventions*. Chichester, New York: Wiley.

Bugental, D. B., Blue, J., & Lewis, J. (1990). Caregiver beliefs and dysphoric affect directed to difficult children. *Developmental Psychology, 26*, 631-638.

Burgess, R. (1978). Child abuse: A behavioral analysis. In B. Lakey & A. Kazdin (Eds.), *Advances in child clinical psychology*. New York: Plenum Press.

Bursik, R. J., & Webb, J. (1982). Community change and patterns of delinquency. *American Journal of Sociology, 88*, 24-41.
Caplan, P. J., Watters, J., White, G., Parry, R., & Bates, R. (1984). Toronto multiagency child abuse research project: The abused and the abuser. *Child Abuse & Neglect, 8*, 343-351.
Caughy, M. O., Brodsky, A. E., O'Campo, P. J., & Aronson, R. (2001). Perceptions of parenting: Individual differences and the effect of community. *American Journal of Community Psychology, 29*(5), 679-699.
Caughy, M. O., O'Campo, P. J., & Brodsky, A. E. (1999). Neighborhoods, families, and children: Implications for policy and practice. *Journal of Community Psychology, 27*(5), 615-633.
Chaffin, M., Kelleher, K., & Hollenberg, J. (1996). Onset of physical abuse and neglect: Psychiatric, substance abuse, and social risk factors from prospective community data. *Child Abuse & Neglect, 20*, 191-203.
Cicchetti, D., & Carlson, V. (Eds.). (1989). *Child maltreatment: Theory and research on the causes and consequences of child abuse and neglect*. New York: Cambridge University Press.
Cicchetti, D., & Lynch, M. (1993). Toward an ecological/transactional model of community violence and child maltreatment: Consequences for children's development. *Psychiatry, 56*(1), 96-118.
Cicchetti, D., & Rizley, R. (1981). Developmental perspectives on the etiology, intergenerational transmission, and squeal of child maltreatment. *New Directions for Child Development, 11*, 31-55.
Cicchetti, D., Rogosch, F. A., Lynch, M., & Holt, K. (1993). Resilience in maltreated children: Processes leading to adaptive outcome. *Development and Psychopathology, 5*, 629-647.
Cicchetti, D., & Toth, S. L. (1995). A developmental psychopathology perspective on child abuse and neglect. *Journal of American Academy of Child and Adolescent Psychiatry, 34*(5), 541-565.
Connelley, C. D., & Straus, M. A. (1992). Mothers' age and risk for physical abuse. *Child Abuse & Neglect, 16*, 703-712.
Coulton, C. J., & Hollister, R. (1998). Measuring comprehensive community initiative outcomes using data available for small areas. In K. Fulbright-Anderson, A. C. Kubisch & J. P. Connell (Eds.), *New approaches to evaluating community initiatives* (Vol. 2, pp. 165-220). Washington, D.C.: The Aspen Institute.
Coulton, C. J., Korbin, J. E., Chan, T., & Su, M. (2001). Mapping residents' perceptions of neighborhood boundaries: A methodological note. *American Journal of Community Psychology, 29*(2), 371-383.
Coulton, C. J., Korbin, J. E., & Su, M. (1996). Measuring neighborhood context for young children in an urban area. *American Journal of Community Psychology, 24*, 5-32.
Coulton, C. J., Korbin, J. E., & Su, M. (1999). Neighborhoods and child maltreatment: A multi-level study. *Child Abuse & Neglect, 23*(11), 1019-1040.
Coulton, C. J., Korbin, J. E., Su, M., & Chow, J. (1995). Community level factors and

child maltreatment rates. *Child Development, 66*, 1262-1276.
Craft, J. L., & Staudt, M. M. (1991). Reporting and founding of child neglect in urban and rural communities. *Child Welfare, 70*, 359-370.
Crittenden, P. M. (1985). Social networks, quality of child rearing, and child development. *Child Development, 56*, 1299-1313.
Curtis, G. C. (1963). Violence breeds violence-perhaps? *American Journal of Psychiatry, 120*, 386-387.
Deccio, G., Horner, W., & Wilson, D. (1994). High-risk neighborhoods and high-risk families: Replication research related to the human ecology of child maltreatment. *Journal of Social Service Research, 18*, 123-137.
Disbrow, M. A., Doerr, H., & Caulfield, C. (1977). Measuring the components of parents' potential for child abuse and neglect. *International Journal of Child Abuse and Neglect, 1*, 279-296.
Drake, B., & Pandey, S. (1996). Understanding the relationship between neighborhood poverty and specific types of child maltreatment. *Child Abuse & Neglect, 20*, 1003-1018.
Dubowitz, H. (Ed.). (1999). *Negleted children: Research, practice, and policy*. Thousand Oaks, CA: Sage.
Dubowitz, H., Hampton, R. L., Bithony, W. G., & Newberger, E. H. (1987). Inflicted and noninflicted injuries: Differences in child and familial characteristics. *American Journal of Orthopsychiatry, 57*, 525-535.
Dubowitz, H., Klockner, A., Starr, R., & Black, M. (1998). Community and professional definitions of child neglect. *Child Maltreatment, 3*, 235-243.
Duncan, G. J., & Raudenbush, S. W. (1999). Assessing the effects of context in studies of children and youth development. *Educational Psychologist, 34*, 29-41.
Egeland, B., Breitenbucher, M., & Rosenberg, D. (1980). A prospective study of the significance of life stress in the etiology of child abuse. *Journal of Consulting and Clinical Psychology, 48*, 195-205.
Egeland, B., & Jacobvitz, D. (1984). *Intergenerational continuity in parental abuse: Causes and consequences.* Paper presented at the Conference on Biosocial Perspectives in Abuse and Neglect, York, ME.
Egeland, B., Jacobvitz, D., & Sroufe, L. A. (1988). Breaking the cycle of abuse. *Child Development, 59*, 1080-1088.
Ernst, J. S. (2002). Community-level factors and child maltreatment in a suburban county. *Social Work Research, 25*(3), 133-142.
Ertem, I. O., Leventhal, J. M., & Dobbs, S. (2000). Intergenerational continuity of child physical abuse: How good is the evidence? *The Lancet, 356*, 814-819.
Fraser, M. W. (1997). The ecology of childhood: A multisystems perspective. In M. W. Fraser (Ed.), *Risk and resilience in childhood: An ecological perspective* (pp. 1-9). Washington, D.C.: NASW Press.
Friedrich, W., & Boriskin, J. (1976). The role of the child in abuse: A review of the literature. *American Journal of Orthopsychiatry, 46*, 580-590.
Frodi, A. M., & Lamb, M. E. (1980). Child abusers' responses to infant smiles and cries. *Child Development, 51*, 238-241.

Fruedenburg, W. R. (1986). The density of acquaintanceship: An overlooked variable in community research? *American Journal of Sociology, 92*(1), 27-63.
Garbarino, J. (1977). The human ecology of child maltreatment: A conceptual model for research. *Journal of Marriage and the Family, 39*, 721-735.
Garbarino, J., & Crouter, A. (1978). Defining the community context for parent-child relations: The correlates of child maltreatment. *Child Development, 49*, 604-616.
Garbarino, J., & Kostelny, K. (1992). Child maltreatment as a community problem. *Child Abuse & Neglect, 16*, 455-464.
Garbarino, J., & Sherman, D. (1980). High-risk neighborhoods and high-risk families: The human ecology of child maltreatment. *Child Development, 51*, 188-198.
Gelles, R. J. (1973). Child abuse as psychopathology: A sociological critique and reformulation. *American Journal of Orthopsychiatry, 43*(4), 611-621.
Gelles, R. J. (1992). Poverty and violence toward children. *American Behavioral Scientist, 35*, 258-274.
Gil, D. (1970). *Violence against children: Physical child abuse in the United States*. Cambridge, MA: Harvard University Press.
Gil, D. (1973). *Violence against children*. Cambridge, MA: Harvard University Press.
Gillham, B., Tanner, G., Cheyne, B., Freeman, I., Rooney, M., & Lambie, A. (1998). Unemployment rates, single parent density, and indices of child poverty: Their relationship to different categories of child abuse and neglect. *Child Abuse & Neglect, 22*(2), 79-90.
Goldstein, H. (2003). *Multilevel statistical models* (3rd ed.). London: Arnold.
Grayson, J. (2001). The state of child neglect. In T. D. Morton & B. Salovitz (Eds.), *The CPS response to child neglect: An administrator's guide to theory, policy, program design and case practice* (pp. 1-32). Duluth, GA: National Resource Center on Child Maltreatment.
Hay, T., & Jones, L. (1994). Societal interventions to prevent child abuse and neglect. *Child Welfare, 73*(5), 379-403.
Heller, S. S., Larrieu, J. A., D'Imperio, R., & Boris, N. W. (1999). Research on resilience to child maltreatment: Empirical considerations. *Child Abuse & Neglect, 23*(4), 321-338.
Hendryx, M. S., & Ahern, M. M. (1997). Mental health functioning and community problems. *Journal of Community Psychology, 25*, 147-157.
Herrenkohl, R., Herrenkohl, E., & Eglof, B. (1983). Circumstances surrounding the occurrence of child maltreatment. *Journal of Consulting and Clinical Psychology, 51*(3), 424-431.
Heyman, R. E., & Slep, A. M. S. (2001). Risk factors for family violence: introduction to the special series. *Aggression and Violence Behavior, 6*, 115-119.
Hox, J. (2002). *Multilevel analysis: Techniques and applications*. Mahwah, NJ: Lawrence Erlbaum Publishers.
Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1-55.
Jack, G. (2000). Ecological influences on parenting and child development. *British*

Journal of Social Work, 30, 703-720.
Janson, C.-G. (1980). Factorial social ecology: An attempt at summary and evaluation. *Annual Review of Sociology, 6*, 433-456.
Jencks, C., & Mayer, S. (1990). The social consequences of growing up in a poor neighborhood. In L. E. Lynn & M. F. H. McGeary (Eds.), *Inner-city poverty in the United States* (pp. 111-186). Washington, DC: National Academy Press.
Kaufman, J., & Zigler, E. (1987). Do abused children become abusive parents? *American Journal of Orthopsychiatry, 57*(2), 186-192.
Kaufman, J., & Zigler, E. (1989). The intergenerational transmission of child abuse. In D. Cicchetti & V. Carlson (Eds.), *Child maltreatment: Theory and research on the causes and consequences of child abuse and neglect* (pp. 129-150). New York: Cambridge University Press.
Kelleher, K., Chaffin, M., Hollenberg, J., & Fischer, E. (1994). Alcohol and drug disorders among physically abusive and neglectful parents in a community-based sample. *American Journal of Public Health, 84*(10), 1586-1590.
Kempe, C. H., Silverman, F. N., Steele, B., Droegemueller, W., & Silver, H. R. (1962). The battered child syndrome. *Journal of the American Medical Association, 181*(1), 17-24.
Kirby, L. D., & Fraser, M. W. (1997). Risk and resilience in childhood. In M. W. Fraser (Ed.), *Risk and resilience in childhood: An ecological perspective* (pp. 10-32). Washington, DC: NASW Press.
Korbin, J. E. (1997). Culture and child maltreatment. In M. E. Helfer, R. Kempe & R. Krugman (Eds.), *The battered child* (5th ed., pp. 29-48). Chicago, IL: University of Chicago Press.
Korbin, J. E., & Coulton, C. J. (1997). Understanding the neighborhood context for children and families: Combining epidemiological and ethnographic approaches. In J. Brooks-Gunn, G. J. Duncan & J. L. Aber (Eds.), *Neighborhood poverty* (Vol. II, pp. 65-79). New York: Sage.
Korbin, J. E., Coulton, C. J., Lindstrom-Ufuti, H., & Spilsbury, J. (2000). Neighborhood views on the definition and etiology of child maltreatment. *Child Abuse & Neglect, 24*(12), 1509-1527.
Kreft, I., & Leeuw, J. D. (1998). *Introducing multilevel modeling*. Thousands Oak, CA: Sage.
Kupersmidt, J. B., Griesler, P. C., de Rosier, M. E., Patterson, C. J., & Davis, P. W. (1995). Childhood aggression and peer relations in the context of family and neighborhood factors. *Child Development, 66*, 360-375.
Lahey, B. B., Conger, R. D., Atkeson, B. M., & Treiber, F. A. (1984). Parenting behavior and emotional status of physically abusive mothers. *Journal of Consulting and Clinical Psychology, 52*, 1062-1071.
Lauderdale, M., Valiunas, A., & Anderson, R. (1980). Race, ethnicity, and child maltreatment: An empirical analysis. *Child Abuse & Neglect, 4*, 163-169.
Leventhal, J. M. (1981). Risk factors for child abuse: Methodologic standards in case-control studies. *Pediatrics, 68*, 684-690.
Leventhal, T., & Brooks-Gunn, J. (2000). The neighborhoods they live in: The effects of

neighborhood residence on child and adolescent outcomes. *Psychological Bulletin, 126*, 309-337.
Lorber, R., Felton, D. K., & Reid, J. B. (1984). A social learning approach to the reduction of coercive processes in child abusive families: A molecular analysis. *Advances in Behavior Research and Therapy, 6*, 29-45.
Lynch, M., & Cicchetti, D. (1998). An ecological-transactional analysis of children and contexts: The longitudinal interplay among child maltreatment, community violence, and children's symptomatology. *Development and Psychopathology, 10*(2), 235-257.
Lynch, M., & Roberts, J. (1977). Predicting child abuse: Signs of bonding failure in the maternity hospital. *British Medical Journal, 1*, 624-626.
Mash, E. J., Johnston, C., & Kovitz, K. (1983). A comparison of the mother-child interactions of physically abused and non-abused children during play and task situations. *Journal of Clinical Child Psychology, 12*(3), 337-346.
Massat, C. R. (1995). Is older better? Adolescent parenthood and maltreatment. *Child Welfare, 74*(2), 325-336.
Miller, B. A., Smyth, N. J., & Mudar, P. J. (1999). Mothers' alcohol and other drug problems and their punitiveness toward their children. *Journal of Studies on Alcohol, 60*(5), 632-642.
Milner, J. (1986). *The Child Abuse Potential Inventory Manual* (2nd ed.). DeKalb, IL: Psytec Inc.
Milner, J. (1994). Assessing physical child abuse risk: The Child Abuse Potential Inventory. *Clinical Psychology Review, 14*, 547-583.
Motluk, A. (1997, May 31). Pollution may lead to a life of crime. *New Scientist,* 44.
National Research Council. (1993). *Understanding child abuse and neglect*. Washington, DC: National Academy Press.
NSCAW Research Group. (2002). Methodological lessons from the National Survey of Child and Adolescent Well-Being: The first three years of the USA's first national probability study on children and families investigated for abuse and neglect. *Children and Youth Services Review, 24*, 513-541.
Oates, R. K., & Forrest, D. (1985). Self-esteem and early background of abusive mothers. *Child Abuse & Neglect, 9*, 89-93.
O'Campo, P. J., Gielen, A., Faden, R., & Kass, N. (1995). Verbal abuse and physical violence among a cohort of low-income pregnant women. *Women's Health Issues, 4*(1), 29-36.
O'Campo, P. J., Xue, X., Wang, M. C., & Caughy, M. O. (1997). Neighborhood risk factors for low birthweight in Baltimore: A multilevel analysis. *American Journal of Public Health, 87*, 1113-1118.
Ouimet, M. (2000). Aggregation bias in ecological research: How social disorganization and criminal opportunities shape the spatial distribution of juvenile delinquency in Montreal. *Canadian Journal of Criminology, 42*(2), 135-156.
Parke, R. D., & Collmer, C. W. (1975). Child abuse: An interdisciplinary analysis. In F. Horowitz, E. M. Hetherington, S. Scarr-Salapatek & G. Siegel (Eds.), *Review of child development research* (Vol. 5, pp. 509-590). Chicago, IL: The University of

Chicago Press.
Pearlman, D. N., Zierler, S., Gjelsvik, A., & Verhoek-Oftedahl, W. (2003). Neighborhood environment, racial position, and risk of police-reported domestic violence: A contextual analysis. *Public Health Reports, 118*(1), 44-58.
Peeples, F., & Loeber, R. (1994). Do individual factors and neighborhood context explain ethnic differences in juvenile delinquency? *Journal of Quantitative Criminology, 10*, 141-157.
Pelton, L. (1994). The role of material factors in child abuse and neglect. In G. Melton & F. Barry (Eds.), *Protecting children from abuse and neglect: Foundations for a new national strategy* (pp. 131-181). New York: Guilford.
Perkins, D. D., & Taylor, R. B. (1996). Ecological assessments of community disorder: Their relationship to fear of crime and theoretical implications. *American Journal of Community Psychology, 24*(1), 63-107.
Perkins, D. D., & Taylor, R. B. (1996). Ecological assessments of community disorder: Their relationship to fear of crime and theoretical implications. *American Journal of Community Psychology, 24*, 63-107.
Pianta, R., Egeland, B., & Erikson, M. F. (1989). The antecedents of maltreatment: Results of the mother-child interaction project. In D. Cicchetti & V. Carlson (Eds.), *Child maltreatment: Theory and research on the causes and consequences of child abuse and neglect*. New York: Cambridge University Press.
Polansky, N. A., Gaudin, J. M. J., Ammons, P. W., & Davis, K. B. (1985). The psychological ecology of the neglectful mother. *Child Abuse & Neglect, 9*, 265-275.
Powers, D. A. (2001). Unobserved family effects on the risk of a first premarital birth. *Social Science Research, 30*, 1-24.
Rabe-Hesketh, S., Pickles, A., & Skrondal, A. (2001). *GLLAMM Manual*. London, UK: University of London.
Rabe-Hesketh, S., Pickles, A., & Taylor, C. (2000). Generalized linear latent and mixed models g129. *Stata Technical Bulletin, 53*, 47-57.
Rabe-Hesketh, S., Skrondal, A., & Pickles, A. (2002). Reliable estimation of generalized linear mixed models using adaptive quadrature. *The Stata Journal, 2*(1), 1-21.
Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*, 385-401.
Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks: Sage Publications.
Roberts, E. M. (1997). Neighborhood social environments and the distribution of low birthweight in Chicago. *American Journal of Public Health, 87*, 597-603.
Rosenbaum, A., & O'Leary, K. D. (1981). Children: The unintended victims of marital violence. *American Journal of Orthopsychiatry, 51*, 692-699.
Rosenberg, M. (1989). *Society and the adolescent self-image* (Revised ed.). Middletown, CT: Wesleyan University Press.
Rosenberg, M. S., & Reppucci, N. D. (1983). Abusive mothers: Perceptions of their own and their children's behavior. *Journal of Consulting and Clinical Psychology, 51*(5), 674-682.

Ross, C. E., & Jang, S. J. (2000). Neighborhood disorder, fear, and mistrust: The buffering role of social ties with neighbors. *American Journal of Community Psychology, 28*(4), 401-420.

Rossow, I. (2000). Suicide, violence and child abuse: A review of the impact of alcohol consumption on social problems. *Contemporary Drug Problems, 27*, 397-433.

Rubin, A., & Babbie, E. R. (2001). *Research method for social work* (4th ed.). Pacific Grove, CA: Wadsworth, Inc.

Runyan, D. K., Curtis, P. A., Hunter, W. M., Black, M. M., Kotch, J. B., Bangdiwala, S., et al. (1998). LONGSCAN: A consortium for longitudinal studies of maltreatment and the life course of children. *Aggression and Violence Behavior, 3*(3), 275-285.

Sameroff, A., & Chandler, M. (1975). Reproductive risk and the continuum of caretaking causality. In F. Horowitz, E. M. Hetherington, S. Scarr-Salapatek & G. Siegel (Eds.), *Review of child development research* (Vol. 4). Chicago: University of Chicago Press.

Sampson, R. J. (1991). Linking the micro- and macrolevel dimensions of community social organization. *Social Forces, 70*(1), 43-64.

Sampson, R. J., Morenoff, J., & Earls, F. (1999). Beyond social capital: Spatial dynamics of collective efficacy for children. *American Sociological Review, 64*, 633-660.

Sampson, R. J., & Raudenbush, S. W. (1999). Systematic social observation of public spaces: A new look at disorder in urban neighborhoods. *American Journal of Sociology, 105*(3), 603-651.

Sampson, R. J., Raudenbush, S. W., & Earls, F. (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science, 277*, 918-924.

Schellenbach, C., Monroe, L., & Merluzzi, T. (1991). The impact of stress on cognitive components of child abuse potential. *Journal of Family Violence, 6*(1), 61-80.

Schumacher, J. A., Slep, A. M. S., & Heyman, R. E. (2001). Risk factors for child neglect. *Aggression and Violence Behavior, 6*, 231-254.

Sebre, S., Sprugevica, I., Novotni, A., Bonevski, D., Pakslniskiene, V., Popescu, D., et al. (2004). Cross-cultural comparisons of child-reported emotional and physical abuse: Rates, risk factors and psychosocial symptoms. *Child Abuse & Neglect, 28*, 113-127.

Sedlak, A. J. (1997). Risk factors for the occurrence of child abuse and neglect. *Journal of Aggression, Maltreatment, and Trauma, 1*, 149-187.

Shaw, C., & McKay, H. (1942). *Juvenile delinquency and urban areas*. Chicago: University of Chicago Press.

Shinn, M., & Toohey, S. M. (2003). Community contexts of human welfare. *Annual Review of Psychology, 54*(1), 427-459.

Shor, R. (2000). Child maltreatment: Differences in perceptions between parents in low income and middle income neighborhoods. *British Journal of Social Work, 30*, 165-178.

Sidebotham, P., Heron, J., & The ALSPAC Study Team. (2003). Child maltreatment in the "children of the nineties": The role of the child. *Child Abuse & Neglect, 27*, 337-352.

Simcha-Fagan, O., & Schwartz, J. E. (1986). Neighborhood and delinquency: An

assessment of contextual effects. *Criminology, 24*, 667-704.
Simons, R. L., Whitbeck, L. B., Conger, R. D., & Wu, C.-I. (1991). Intergenerational transmission of harsh parenting. *Developmental Psychology, 27*(1), 159-171.
Snijders, T., & Bosker, R. (1999). *Multilevel analysis: An introduction to basic and advanced multilevel modeling*. London, UK: Sage.
Spinetta, J. J., & Rigler, D. (1972). The child abusing parent: Psychological review. *Psychological Bulletin, 77*, 296-304.
StataCorp. (2003a). Stata Statistical Software: Release 8.0. College Station, TX: Stata Corporation.
StataCorp. (2003b). *Stata survey data: Reference manual release 8.0*. College Station, TX: Stata Press.
Stiffman, M. N., Schnitzer, P. G., Adam, P., Kruse, R. L., & Ewigman, B. G. (2002). Household composition and risk of fatal child maltreatment. *Pediatrics, 109*(4), 615-621.
Sullivan, P. M., & Knutson, J. F. (2000). Maltreatment and disabilities: A population-based epidemiological study. *Child Abuse & Neglect, 24*, 1257-1273.
Taylor, R. B., Gottfredson, S. D., & Brower, S. (1984). Block crime and fear: Defensible space, local social ties and territorial functioning. *Journal of Research in Crime and Delinquency, 21*, 303-331.
Tienda, M. (1991). Poor people and poor places: Deciphering neighborhood effects on poverty outcomes. In J. Huber (Ed.), *Macro-micro linkages in sociology* (pp. 244-262). Newbury Park, CA: Sage.
Tinbergen, N. (1951). *The study of instinct*. London: Oxford University Press.
Trickett, P. K., & Susman, E. J. (1988). Parental perceptions of child-rearing practices in physically abusive and nonabusive families. *Developmental Psychology, 24*, 270-276.
Turley, R. N. L. (2003). When do neighborhoods matter? The role of race and neighborhood peers. *Social Science Research, 32*(1), 61-79.
Tzeng, O. C. S., Jackson, J. W., & Karlson, H. C. (1991). *Theories of child abuse and neglect*. New York: Praeger.
U.S. Advisory Board on Child Abuse and Neglect. (1993). *Neighbors helping neighbors: A new national strategy for the protection of children*. Washington, DC: US Government Printing Office.
U.S. Department of Health & Human Services. (2000). *Child maltreatment 2000*. Washington, DC.
U.S. Department of Health & Human Services. (2001). *Child maltreatment 2001*. Washington, DC.
Unknown. (1997). Pollution is linked to violent crime. *BioCycle, 38,* 6.
Vela-McConnell, J. A. (1999). *Who is my neighbor? : social affinity in a modern world*. Albany: State University of New York Press.
Vinson, T., Baldry, E., & Hargreaves, J. (1996). Neighborhoods, networks and child abuse. *British Journal of Social Work, 26*, 523-543.
Wallace, H. (1999). *Family violence: Legal, medical, and social perspectives* (2nd ed.). Boston: Allyn and Bacon.

Webster-Stratton, C. (1989). The relationship of marital support, conflict, and divorce to parent perceptions, behaviors, and childhood conduct problems. *Journal of Marriage and the Family, 51*(2), 417-430.
Wharton, R., & Mandell, F. (1985). Violence on television and imitative behavior: Impact on parenting practices. *Pediatrics, 75*(6), 1120-1123.
Wheaton, B., & Clarke, P. (2003). Space meets time: Integrating temporal and contextual influences on mental health in early adulthood. *American Sociological Review, 68*, 680-706.
Whipple, E. E., & Webster-Stratton, C. (1991). The role of parental stress in physically abusive families. *Child Abuse & Neglect, 15*, 279-291.
Widom, C. S. (2001). Alcohol abuse as a risk factor for and consequence of child abuse. *Alcohol Research & Health, 25*(1), 52-57.
Williamson, J. M., Bordium, C. M., & Howe, B. A. (1991). The ecology of adolescent maltreatment: A multilevel examination of adolescent physical abuse, sexual abuse, and neglect. *Journal of Consulting and Clinical Psychology, 59*, 449-457.
Winton, C. A. (1995). *Frameworks for studying families*. Guilford, CT: Dushkin.
Winton, M. A., & Mara, B. A. (2001). *Child abuse and neglect: Multidisciplinary approaches*. Needham Heights, MA: Allyn & Bacon.
Wolfe, D. A. (1985). Child abusive parents: An empirical review and analysis. *Psychological Bulletin, 97*, 462-482.
Wolfe, D. A. (1991). *Preventing physical and emotional abuse of children*. New York: Guilford Press.
Wolfe, D. A. (1999). *Child abuse: Implications for child development and psychopathology* (2nd ed.). Thousands Oaks, CA: Sage.
Wolfe, D. A., Fairbank, J., Kelly, J. A., & Bradlyn, A. S. (1983). Child abusive parents' physiological responses to stressful and nonstressful behavior in children. *Behavioral Assessment, 5*, 363-371.
Wolfe, D. A., McMahon, R. J., & Peters, R. D. (Eds.). (1997). *Child abuse: New directions in prevention and treatment across the lifespan*. Thousand Oaks, CA: Sage.
Wolfe, D. A., & Mosk, M. D. (1983). Behavioral comparisons of children from abusive and distressed families. *Journal of Consulting and Clinical Psychology, 51*(5), 702-708.
Zuravin, S. (1988). Fertility patterns: Their relationship to child physical abuse and child neglect. *Journal of Marriage and the Family, 50*, 983-993.
Zuravin, S. (1989). The ecology of child abuse and neglect: Review of the literature and presentation of data. *Violence and Victims, 4*, 101-120.
Zuravin, S. (1999). Child neglect: A review of definitions and measurement research. In H. Dubowitz (Ed.), *Neglected children: Research, practice, and policy*. Thousand Oaks, CA: Sage.

VITA

Jin Seok Kim was born in Chonju, a small city of South Korea on July 21, 1968, the youngest son of Heung-Kyu Kim and Sun-Rye Lee. After graduation from Chonju High School, Chonju, Korea, in 1986, he entered the Seoul National University in Seoul, Korea where he studied Physics. During 1990 and 1992, he served the mandatory military service and backed to school on Oct 1992. He received the degree of Bachelor of Science in 1994 and Master of Science in physics in 1996 from the Seoul National University. During the following three and a half years, Mr. Kim worked as an advanced researcher in Samsung Advanced Institute of Technology, Kiheung, Korea. In August 1999, Mr. Kim entered the social work master program at the School of Social Work of the University of Texas at Austin. He graduated with a Master of Science in Social Work degree in May 2001 and moved forward to the social work doctoral program at the same school. From Jan 2000 to Jan 2004, Mr. Kim worked as a graduate research assistant at the Center for Social Work Research housed in the School of Social Work of the University of Texas at Austin. Since Jan 2004, he has been an Assistant Instructor in the School of Social Work of the University of Texas at Austin while completing his dissertation.

Permanent Address: 3372-B Lake Austin Blvd.,
Austin, TX 78703
(512) 576-4693,
praxis6887@yahoo.com

This dissertation was typed by the author.